AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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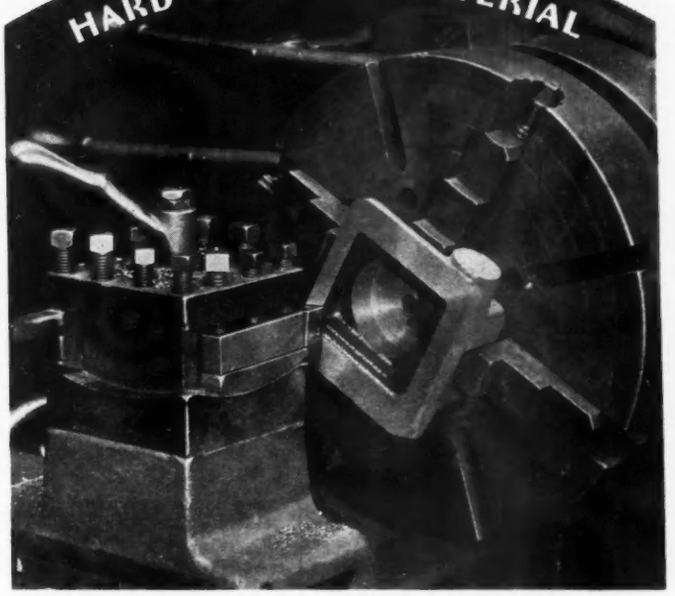

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For example on the operation illustrated above which had been run previously on High Speed Steel at 74½ S.F.M. Same depth of cuts with feed per revolution .010. Note this comparative record:

MATERIAL—Cast iron gear housing
TOOL—⅝x1¼ Vascoloy-Ramet tipped tool
OPERATION—Intermittent facing operation
SPEED—260 S.F.M.
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Feed per Revolution .015

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AUTOMOTIVE INDUSTRIES

Vol. 72, No. 20 ▫ THIRTY-SEVENTH YEAR ▫ May 18, 1935

Nash Adds Steel Top 6 at $675

New Engine Has No Exposed Manifolds; Develops 90 Hp.

by Joseph Geschelin

Detroit Technical Editor, Automotive Industries

With list prices ranging from $675 to $790, and featuring six body styles of all steel construction including roof and under body and a 90 hp. L-head engine with cored in manifolding, the new six-cylinder model added to the Nash line this week fits in between the Advanced Six and the LaFayette.

New Nash Six Prices

2-pass. business coupe	$675
Rumble seat coupe	725
2-door victoria	715
Touring victoria with trunk	745
4-door sedan	765
Touring sedan with trunk	790

For comparison, prices on the LaFayette range from $580 to $710, and on the Nash Advanced Six from $825 to $875.

Chassis units such as axles, transmission and ventilated Borg & Beck clutch are the same as in the Advanced Six, but the frame is new. Hydraulic brakes and clutch pedal starting are continued.

The wheelbase of the new job is 117 in. and the curb weight of the four-door sedan is 3100 lb. The engine, which peaks at 3400 r.p.m., has a 3⅜-in. bore and 4⅜-in. stroke and a compression ratio of 5.58.

An unusual feature of the upper structure is independent mounting of the front fender assembly and radiator, freeing these elements of vibration effects from the frame. The hood, hood sides and radiator grille come as an integral unit hinged at the cowl and lifting upward from the front.

The "Monitor Sealed Motor" has no exposed manifolding, the intake being

(*Turn to page* 660, *please*)

Slower Pace Seen in June as Industry Pushes Toward 400,000 Mark for May

by Harold E. Gronseth

Detroit News Editor, Automotive Industries

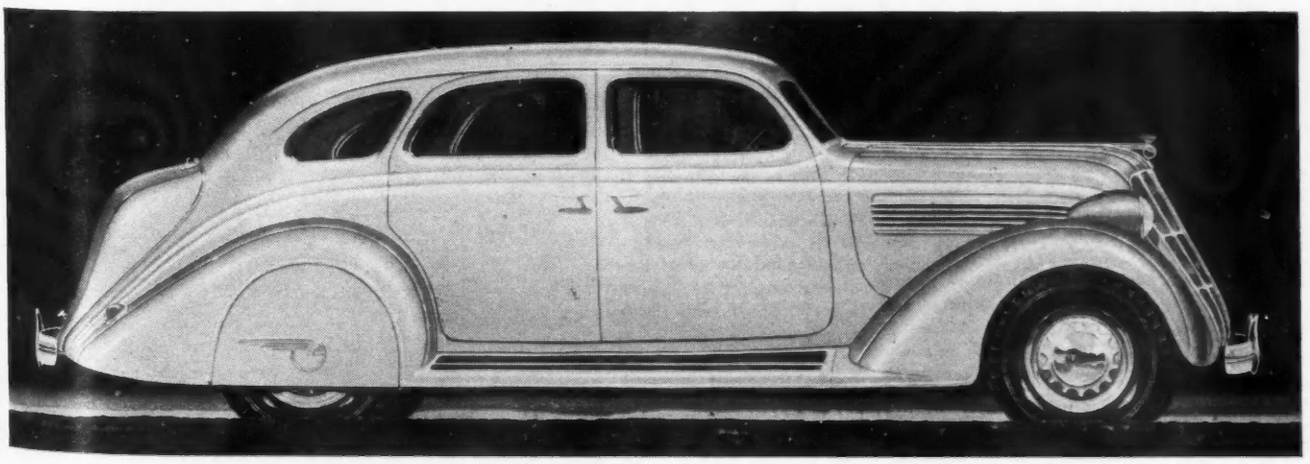
Barring further labor disturbances, the production rate of the motor industry is likely again to attain the year's top speed which was abruptly checked at the start of the month by the strike enforced curtailment of Chevrolet. But it will not be for long—possibly only the final week of May will hit the former stride.

Heavy banks of unfilled orders held by some of the important producers have been dwindling and with a few exceptions the industry will go into June pretty well cleaned up on orders, indicating that the June production rate will be tuned closely to the retail market, and generally speaking immediate deliveries will be available on all popular body types.

Unless an unexpected demand develops in the summer, April will stand as the peak production month this year with an estimated output of 477,546 units. As it now appears, May will do well to pass the 400,000 mark. It should be not far from this figure, however, or well above the May, 1934, output of 351,813 units.

There is currently a hesitancy in the re-

(*Turn to page* 680, *please*)



Six-passenger sedan with built-in trunk in new Nash "400" Series

Most of Business Recovery Credited to Three Leading Car Producers by Ayres

Most of the business recovery that we have had in this country in the past two years has been contributed by three industrial corporations, according to Col. Leonard P. Ayres, in the *Business Bulletin* of the Cleveland Trust Co.

They are the three leading producers of automobiles who manufacture most of the cars and trucks that are made in this country. All the net gain in the volume of industrial production from 1933 to 1934 was equal to that made by the automotive industries, and the suppliers of its materials, and the gains so far in the production of 1935 over 1934 have been mostly due to the same factors.

These astonishing results are a striking tribute to the ability of those producers to improve the quality of their goods, and to decrease their prices, in spite of higher wage rates and shorter hours. They also constitute vivid testimony of the insistent desire of the American people for new and better individual and family transportation. Nevertheless the sustained vigor of automobile manufacturing does not furnish an adequate basis for general business recovery. We need an expanding recovery spreading from one industry to another and another like a beneficent contagion that will effectively absorb unemployment.

The latest Federal Reserve Board figures are for March. They show factory production at higher levels than one year earlier, and the same is true for factory employment and payrolls. They show that mineral output was lower than in March of last year, and construction less, and freight-car loadings smaller, and the value of department store sales less. Apparently as a nation we are far more willing to spend our money for new automobiles than we are to make any other important kinds of purchases, either of goods or of investments.

It seems likely that automobile production has passed its peak for this year, but it is probable that it will hold up relatively well during the rest of the year. The most hopeful additional factor in the outlook is to be found in the current figures for new construction which are showing increases. If the construction industry could offer increasingly better values at progressively lower prices, so that each purchaser would be confident that he had secured a real bargain, as the automobile industry succeeds in doing, our recovery problems would find rapid solution.

Ask President, Congress to Eliminate U.S. Gas Tax

Twenty-two national organizations jointly petitioned the President and Congress last Monday to discontinue excise taxes on gasoline, automobiles, parts, tires, oils and other products used in motor transportation.

The petitioning organizations are:

American Automobile Association; The National Grange; American Farm Bureau Federation; The Farmers' Union; American National Live Stock Association; International Association of Milk Dealers; National Dairy Union; American Association of Creamery Butter Manufacturers; American Motorists Association; National Food Distributors Association; American Trucking Associations, Inc.; National Association of Motor Bus Operators; National Automobile Dealers Association; Motor and Equipment Manufacturers Association; The Asphalt Institute; Independent Petroleum Association of America; American Petroleum Industries Committee; Rubber Manufacturers Association; American Petroleum Institute; Automobile Manufacturers Association; National Association of Retail Druggists; National Retail Hardware Association.

The petition was presented by the National Highway Users Conference on behalf of the signatories. Legislatures of 21 states have memorialized Congress, by action of both legislative branches in each case, to eliminate the Federal tax on gasoline. Exhibits attached to the petition also show more than 200 national, state and local organizations have lodged formal protests against reenactment of the Federal gasoline tax provisions.

Unit Corp. Reorganizing

Unit Corp. of America, Milwaukee, manufacturer of forgings, gears and automotive accessories, in receivership since February, 1932, is being reorganized under a plan submitted jointly by the creditors' committee and preferred stockholders to the Milwaukee Circuit Court and which has been approved. The plan places creditors in control for six years. Upon payment of creditors' claims of $270,000, the preferred stockholders will again be in control. J. Seton Gray, receiver, will continue to be in charge of the concern under the new set-up.

Service Show Reservations Indicate Record Turnout

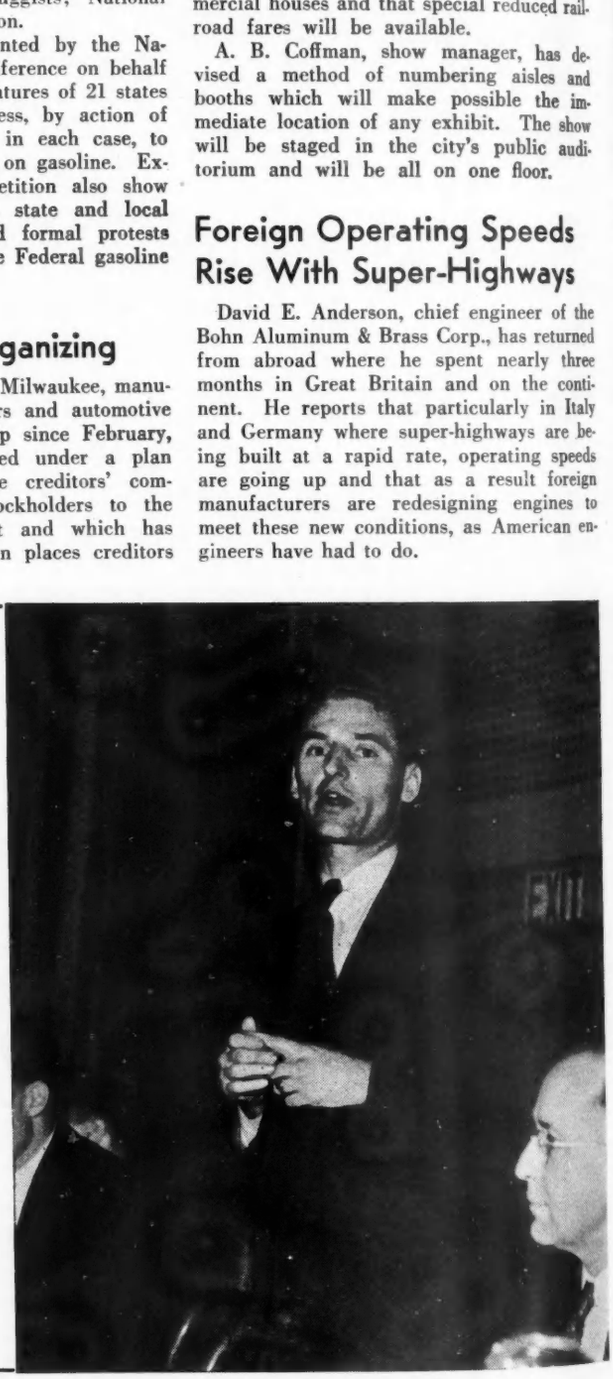
Advance reservations and inquiries being received by Atlantic City Hotels for the Automotive Service Industries Show, Dec. 9 to 13, indicate another record participation, according to a statement from the Joint Operating Committee.

The committee has announced that special arrangements have been made with boardwalk hotels to set aside a quota of rooms for those attending the show at rates comparable with those prevailing in commercial houses and that special reduced railroad fares will be available.

A. B. Coffman, show manager, has devised a method of numbering aisles and booths which will make possible the immediate location of any exhibit. The show will be staged in the city's public auditorium and will be all on one floor.

Foreign Operating Speeds Rise With Super-Highways

David E. Anderson, chief engineer of the Bohn Aluminum & Brass Corp., has returned from abroad where he spent nearly three months in Great Britain and on the continent. He reports that particularly in Italy and Germany where super-highways are being built at a rapid rate, operating speeds are going up and that as a result foreign manufacturers are redesigning engines to meet these new conditions, as American engineers have had to do.



Fred Seiger, organizer and president of the Independent Workers Society, addressing members of the organization during the Chevrolet strike in Toledo. He has been employed by Chevrolet since 1931 in the shipping and receiving department and runs an electric truck around the plant

Rail Income Up 55% On Motor Shipments

Traffic Men Discuss Proposed Rate Changes on Export Shipments

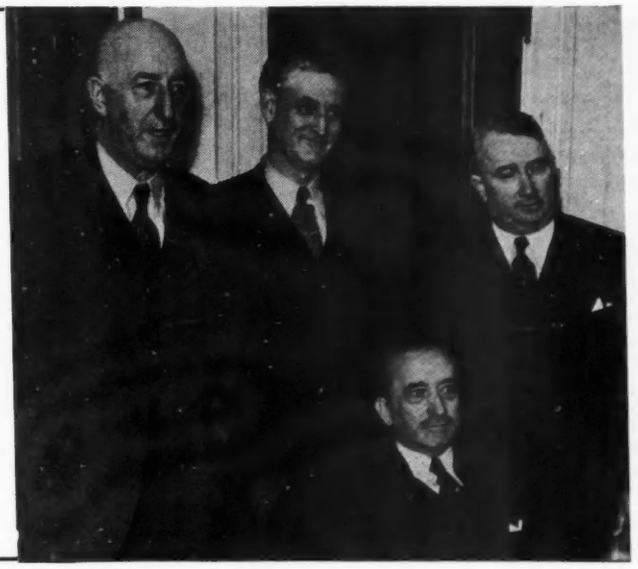
A gain of $30,281,442, equal to 55 per cent, in railroad earnings on shipments of automobiles, trucks, parts and tires in 1934, was reported by J. S. Marvin of the Automobile Manufacturers Association at the recent meeting of Traffic Managers in Detroit.

Mr. Marvin stated that the figures are based on Interstate Commerce Commission statistics just completed for 1934, indicating that 472,606 carloads of these commodities were shipped compared with 296,010 carloads in 1933. The figures do not include all the freight received at automobile plants as iron and steel, coal, lumber, oil and other commodities are carried in other classifications of the Commission's statistics.

The ICC reports on shipments of automobiles, trucks, parts and tires for the past three years are:

	Carloads	Railroad Revenue
1932	214,023	$41,270,008
1933	296,010	54,664,463
1934	472,606	84,963,651

The meeting considered a number of ratings on automobiles and parts, including proposed changes in rates on export shipments to the Atlantic and Pacific seaboards.



Assistant Secretary of Labor McGrady, seated, with Thomas J. Williams, left, Labor Department conciliator; T. N. Taylor, AFL organizer in Toledo, center, and Francis J. Dillon, Detroit organizer for AFL, left, as they conferred on the Chevrolet strike in the Ohio city.

Col. Dennis To Discuss Motor Vehicle Inspection

An address on the subject of municipal inspection of motor vehicles by Col. Fred L. Dennis, director of safety of The Bendix Products Corporation, will be one of the features of the three day sales convention of Bendix distributors to be held at South Bend beginning May 20. Colonel Dennis will make his talk on the night of May 20 and it is expected that more than 300 Bendix distributors from all parts of America will attend.

Johnson Co. Shipments in April Biggest Since '32

The Johnson Motor Company reports that April shipments were the largest for any month since July, 1932, and 71 per cent ahead of April, 1934.

It was only during the last few days of the month that production was able to meet the unexpectedly large demand for the new Aero-built Model 300 motor first introduced to the public at the National Motor Boat Show in January,

Pontiac Hits Blended Oils for Breaking-In

Pontiac dealers are advised to urge owners to use only 10-W pure petroleum oil for breaking in engines, in a bulletin just issued by the factory service department. "Some owners," the bulletin says, "have the impression that new engines require specially blended oils during the breaking-in period, and some concerns have supplied special mixtures for this purpose. Many of these compounds contain substances which may be corrosive to bearings and other engine parts. These oils are definitely harmful —do not use them."

Study of Alcohol-Blend, Straight Fuel Proposed

The American Petroleum Institute has called upon the Chemical Foundation to join with it in financing an impartial investigation of the relative merits of alcohol-blend and straight gasoline motor fuels.

In a letter to Francis P. Garvan, president of the Foundation, dated May 7, Axtell J. Byles, president of the Institute, national trade association of the petroleum industry, said his organization was ready to assume one-half of the expense of an impartial, economic, and technical investigation by competent disinterested experts. He suggested that the total cost should not exceed $30,000, each organization paying half.

A copy of the letter was forwarded to the Joint Conference of Agriculture, Industry and Science held last week at Dearborn, Mich., at which alcohol-blend fuels were discussed.

"It is probably unnecessary to state," Mr. Byles wrote, "that the petroleum industry does not share the optimism expressed by your organization as to alcohol-gasoline blends."

J. N. Willys Stricken

John M. Willys, Toledo, O., automobile manufacturer, who went to Louisville with Mrs. Willys on May 3, for the Kentucky Derby, has been ill at the Norton Memorial Infirmary in that city; late reports indicate that he is somewhat better.

Senate Votes to Extend NRA 10 Mos.; Fate of Recovery Act Now Up to House

WASHINGTON, May 15—The Senate yesterday passed the Clark resolution extending NRA to April 1, 1936, but with price fixing barred except in natural resource industries and wholly intrastate business exempted from code provisions. No record vote was taken, the Senate acting with surprising speed in the face of the Administration's demand for a two-year extension of the Act with extensive changes.

So far as automotive manufacturers are concerned, the Clark resolution is a more satisfactory disposition of NRA than the Administration measure, since the former leaves the labor provisions of the original act unchanged, while the latter would modify them objectionably.

Many think enactment of the Clark resolution would sound the death knell of NRA and there is considerable opinion that that is what the Senate wants to do. Extension of the act for 10 months would be complete folly, according to Donald Richberg, head of NIRB, because uncertainty over the ultimate fate of the law would make effective administration impossible.

Despite the Administration's desire for a two-year extension, Senators Robinson, Harrison and others have expressed the opinion that the President will sign the Clark resolution if it is passed by the House. However, Democratic members of the House Ways and Means Committee are sticking to the Administration measure, so what ultimate legislation will provide, still is conjectural.

Before yesterday's vote, Senator Harrison warned that if the House passed the Administration bill, it would have to come before the Senate as new legislation, there to meet opposition that would probably delay action until after the June 16 expiration date of the present law. He said that it would take weeks for the Senate to act on new legislation and that it was better to extend the law with modifications, letting the writing of a new act go over until the next session when court decisions on constitutional issues would be available for the guidance of Congress.

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Chevrolet Resumes Normal Operations; Terms of Strike Settlement in Full

TOLEDO, May 15—Normal production of Chevrolet transmissions was under way within two hours after the resumption of operations at 6 a. m. today in the plant here which has been closed since April 23 by a strike.

Strikes at the Fisher plant in Cleveland and at the Chevrolet assembly plants in Norwood, Ohio, and Atlanta, have been called off pending negotiations similar to those which ended the trouble here. Threatened walk-outs in Flint have been averted.

The settlement which ended the strike raised the minimum wage to 54 cents and awarded a minimum increase of 4 cents per hour to all employees, including hourly office workers. It also provides for a shop committee, further discussion of seniority, and time and a half for overtime and holidays. It does not recognize the union as the exclusive bargaining agency; and no contract has been entered into with the union. The terms of the settlement are to be posted on the plant bulletin board and filed with the U. S. Department of Labor.

W. S. Knudsen headed the group of General Motors executives which negotiated the settlement. Representing the union, were James Roland, heading the strike committee, and a group of A. F. of L. officials headed by F. J. Dillon, Detroit general organizer. The Federal Government was represented by Edward F. McGrady, assistant secretary of labor, and Thomas J. Williams, conciliator.

The union's decision to accept the settlement came Monday night by a vote of 732 to 385 at the conclusion of the stormiest and most dramatic labor union meeting ever held in Toledo, with Mr. Roland leading the opposition to acceptance.

The settlement terms follow in full:

ARTICLE 1

Sec. 1. The company agrees to meet with the duly accredited representatives of its employees upon all questions arising between the company and its employees, with a view of adjusting any grievances and complaints which may now exist or which may arise in the future.

ARTICLE 2

Sec. 1. The right to have a shop committee representing employees is conceded, such committee to be composed of nine members, including the chairman. The method of selection of said committee, its chairman, and spokesman shall be left to the employees, and the company agrees to negotiate with accredited spokesman or representative of employees through said committee.

Sec. 2. Any grievance or complaint which cannot be adjusted between the accredited representative of employees and the shop foreman may be referred to a higher officer of the company.

Sec. 3. The company agrees that there shall be no discrimination against any of the employees on account of services on said committee.

ARTICLE 3

Sec. 1. Any employee who has been discharged or suspended can appeal the case to the superintendent or to the general manager, either through the executive shop committee or personally. The company shall make every effort, if case is presented within 24 hours of the discharge or suspension, to render final decision within three working days thereafter.

Sec. 2. Any employee reporting for work and then sent home or refused work shall receive no less than one hour's pay, unless said employee was notified not to report to work.

Sec. 3. All time worked over forty-eight (48) hours per week shall be paid for at the rate of one and one-half times the regular rate of pay.

Sec. 4. Work on legal holidays shall be compensated at the rate of one and one-half times the regular rate of pay and said holidays shall begin at twelve o'clock midnight and continue for the following 24 hours. The following days shall be considered as legal holidays: all Sundays, New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas.

ARTICLE 4

Sec. 1. The company is at present operating under seniority rules established by authority of the president of the United States. The executive shop committee and the company will attempt to reconcile their viewpoints in respect to the application of seniority rules.

Sec. 2. The company will furnish any individual employee a record of his seniority upon request.

ARTICLE 5

Sec. 1. The minimum wage shall be fifty-four (54) cents per hour. No employee shall receive less than a four (4) cents per hour increase.

Sec. 2. An hourly rate production employee who due to lack of work is placed on a job paying a lower wage will not be subject to a reduction greater than ten per cent (10%) of his previous rate. When regular work is resumed and the employee goes back to his original job, his former rate will apply.

Sec. 3. The committee shall have the privilege of discussing timing on jobs which they feel are not right.

Sec. 4. Pay day shall be weekly on Friday as soon as the necessary equipment can be installed.

Where an employee is unable to report for work on account of sickness, accident or other similar cause, his name shall not be removed from the pay roll provided the company is notified within three (3) days.

In case of a reduction in force the company shall give not less than 24 hours' notice to all employees who are to be laid off.

First Ford V-8 Powered Race Car Ready for Test

The first of ten fast racing cars, powered by Ford V-8 engines, built under the direction of Harry Miller, has been shipped to Indianapolis for tests preliminary to entry in the 500-mile race at the Indianapolis Motor Speedway Decoration Day. The entries are sponsored by a group of Ford dealers. The other nine cars are expected to be ready before the elimination trials close May 28.

The Ford V-8 Specials will be piloted in the big race by a crew of crack drivers, including Pete de Paolo, Dave Evans, Bill Winn, Cliff Bergere and Ted Horn.

The ten racing cars are of the front-drive type and are expected to average 116 miles an hour or better in qualifying tests. Appearing from above like a "flying red squirrel," the cars are fully streamlined, even the axles and the spring action being "booted." The bodies are finished smoothly, not a bolt or nut obstructing free air flow.

The chassis is of the straight-frame type. Springs are transverse, in accord with Ford practice. The front drive unit, of Miller design, is mounted ahead of the engine and is fully streamlined. The car is unusually low, the driver and mechanic sitting in staggered seats well within the body. A spherical gas tank of 15 gallons capacity is mounted back of the seats in the cigar-shaped rear body.

F. H. Webster

Newly appointed director of purchases of The White Motor Company. He succeeds Bert Graves who was promoted to the staff of M. R. Kavanagh, production manager.

Knudsen Lauds Engineers, Workmen in SAE Address

Apparently undaunted by the Toledo labor situation which was still unsettled during the early part of the evening, W. S. Knudsen talked briefly on the role of the engineer in automotive development at the meeting of the Detroit Section held on Monday of this week. With rare good humor the speaker started with the statement that, "in the past few weeks I have had a striking illustration of how Section 7A operates." Despite the storm clouds on the horizon, Mr. Knudsen reiterated his faith in the American workman and in the ultimate solution of misunderstandings between labor and management which was rather prophetic, since about that time the Toledo union mass meeting was voting to accept the management's settlement terms.

With the statement that "the function of management belongs to management and that a business belongs to the stockholders," the speaker set down his philosophy of business in a democracy.

Turning to the role of the engineer, Mr. Knudsen said that today the engineer is more versatile, more flexible, more conversant with production and management problems. He asked for continued cooperation between the engineer and the shop man in the solution of common problems. In addition to his other attributes, the engineer must sense what the public wants, if he is to continue to develop new ideas. Cars must continue to be made lighter, but more stable on the road.

C. F. Kettering acted as toastmaster, while Edward Hann contributed some serio-comic highlights of patents through the years. Over 700 were at the dinner, which preceded the meeting.

The following officers were elected for the season 1935-36:

Peter Altman, chairman; R. J. Waterbury, secretary; F. W. Marschner, treasurer (re-election); vice-chairmen of activities: Passenger Car, Harold Youngren; Body, A. J. Neerken; Aeronautical, L. A. Majneri; Production, V. P. Rumely; Student, R. N. Janeway.

MESA Demands Wage Rise at Four Fisher Plants; Car Manufacturers Backing ALB

DETROIT, May 16—Just as the settlement of the Toledo Chevrolet strike raised the hopes of normal operating conditions in the motor industry, a new threat appeared on the horizon in the submission of demands for wage increases on four Detroit plants of Fisher Body Corp. by the MESA.

The MESA, which sponsored the tool and die strike at the start of the 1934 new model season, is asking a 15 per cent flat increase in wages and establishment of a minimum of $1 an hour. Matthew Smith, general secretary, said that the minimum rate now is 80 cents for machine men and $1 for bench men, and that the demands were prompted by an increase in cost of living in Detroit, which according to Department of Labor figures issued April 9, he said, was 17.1 per cent.

Demands were made on Fisher Plants Nos. 1, 37, 46 and 23. The latter is said to be the biggest tool and die shop in the world, employing, according to Mr. Smith, 3500 workers in that trade, while the other three plants together employ 500 workers. The demands were submitted Tuesday. MESA officials met with the Fisher management today. The demand for a flat pay increase was turned down, but the company promised to continue giving individual increases. Meetings of MESA members are scheduled over the next two or three days at which it will be decided whether to call the strike threatened by Mr. Smith. Because of the moving ahead of the new model season this year and the policy of staggering the work over a longer period, the tool and die trade is just coming into its active season, according to Mr. Smith, who said that these plants have been taking on men in considerable numbers during the past month.

The society also is considering a proposal to make demands on a motor car company in which it claims a substantial membership among the production men.

A threatened strike at the Hupp Motor Car Corp. was averted, at least for the time being, by the closing of the plant on Tuesday, the day set for holding the ALB election in that plant. The AFL had threatened to strike if the election was held, but the management announced that because of shortage of material which had developed at the close of the past week the plant would not operate. Operations were resumed again Wednesday noon and were expected to reach full tilt before the end of the week.

No date has been set by the Labor Board for its election and it is not definitely known if one will be held. It will depend upon whether the management desires one, and it has not as yet expressed itself on that point. It is understood the board stands ready to hold an election if the management desires it, but should neither management nor employees favor one, there is little likelihood that the board will insist. In line with its general opposition to the ALB, the AFL has threatened to strike at both the Nash and Hupp plants if elections are called, claiming that agreements with the union exist in both plants. The Hupp management denies that it has any agreement to bargain solely with federation representatives.

The federation's strong and somewhat effective opposition to the ALB has raised the question of the survival of the board. Aside from the federation's repudiation of the board, there is nothing to indicate that its existence will be terminated. The manufacturers have always shown a disposition to comply with the terms of the President's settlement of which the establishment of the ALB was a vital part, and are not believed likely to accede to its abolition. In commenting on the vote plan at the Toledo plant, W. S. Knudsen said, "We have not in any way changed our relationship to the Automobile Labor Board and will continue to operate under the President's settlement of March 25, 1934." He considered the Toledo poll an emergency measure which did not in any way affect the authority of the board.

Three or four major elections are still to be held by the ALB in addition to quite a number of special elections in the larger plants where white collared workers were omitted from the first balloting but later asked for elections. Several recall and replacement elections also are scheduled. But the board considers its most important work that of educating the workers to collective bargaining and to the proper use of the machinery set up by the President for labor-management relations.

Little significance is attached to the resolution of the Officers Association of the Automobile Industrial Employees asking removal of Dr. Wolman and Mr. Byrd from the board, the action being considered as representing the opinion of the officers and not of their constituents. Several of the officers are said to be AFL men or with federation training and therefore imbued with the federation's partisan viewpoint.

RFC Grants Continental Motors $1,000,000 Loan

A loan of $1,000,000 has been granted Continental Motors Corp. by the RFC. The added working capital will be used to increase production at both its Detroit and Muskegon plants. The company anticipates doing a larger percentage of work on next year's models for which releases are expected to start late in the summer.

Strike Closes Willard Plant in Cleveland

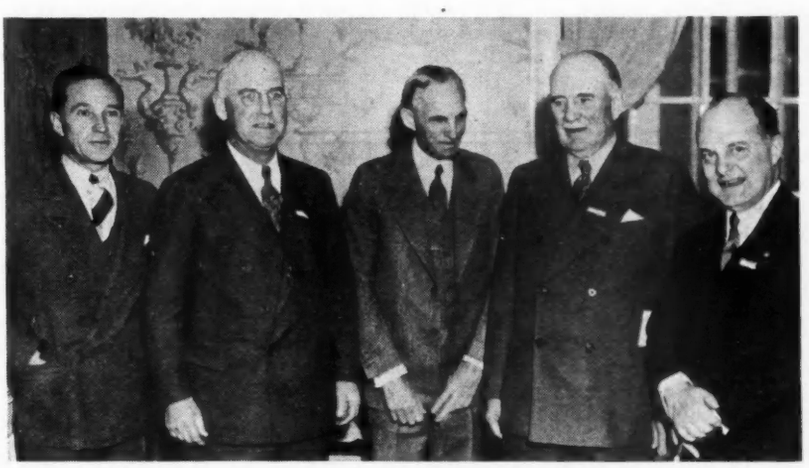
The Willard Storage Battery Co. plant in Cleveland was closed on Friday of last week as a result of a strike called by the Battery Workers Federal Labor Union which is reported to have demanded a 30-hr. week, time-and-a-half for overtime, a base rate increase of 10 cents hourly, seniority, a grievance committee and a signed contract. The company states that it has increased hourly rates twice in the last year and that they are now 19 per cent higher than in 1929. It also states that the union represents only a small proportion of the plant's workers which number between 800 and 900.

Richberg Meets Leaders, Discuss Strike and Code

Donald Richberg, NIRB chairman, conferred with Alfred P. Sloan, Jr., Walter P. Chrysler and other leaders in the industry, in New York on Sunday. He said he made no proposal for the settlement of the Toledo strike but simply sought information as to how the strike might affect the industry and the automobile manufacturing code.

Senate Debates Wagner Bill

Debate on the Wagner Labor Relations Bill started this week in the Senate with administration leaders predicting its passage. The Bill has been reported favorably by the House Labor Committee.



Automobile manufacturers who attended the recent conference of agricultural, scientific and industrial leaders at Dearborn. From left to right they are Edsel Ford, Alvan Macauley, Henry Ford, C. W. Nash and Robert Graham

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

No marked upward trend in general business activity was visible last week. Activity in several important industries declined seasonally, while retail trade was adversely affected by unfavorable weather. Wholesale trade also declined, although it compared favorably with the level a year ago.

Freight Movement Slackens

The railway freight movement during the week ended May 4 continued to show a decline from the level of the corresponding period last year. Loadings for that period totaled 569,065 cars, which marks a gain of 10,179 cars, or 1.8 per cent, from the total for the preceding week, but a decline of 36,181 cars, or 6.0 per cent, from that for the similar period a year ago.

Current Output Higher

Production of electricity by the electric light and power industry of the United States for the week ended May 4 was 4.0 per cent above that for the corresponding period last year. This is the largest gain over last year's comparable figure reported since the week ended April 13.

Farm Prices Rise

The farm price index of the United States Department of Agriculture for April 15 stands at 111, showing an increase of 3 points from the figure a month earlier. The index of prices paid by farmers for the same date stands at 128, as against 127 on March 15, while the ratio of prices received to prices paid is 87, as against 85 a month earlier and 68 a year ago.

Lumber Shipments Gain

Shipments from the lumber mills during the week ended May 4 were the heaviest of any week since 1931, while new business booked was only slightly below that of the two preceding weeks and with that exception was the largest in volume since November, 1933. Production was below that reported for the preceding eight weeks.

Crude Production Lower

Average daily crude oil production for the week ended May 4 amounted to 2,494,100 barrels, showing a drop of 67,300 barrels from the output for the preceding week. It compares with the new Federal allowable figure of 2,561,200 barrels, which became effective on May 1.

Greater Wheat Harvest

The official report on the winter wheat crop, based on conditions May 1, indicates a yield of 431,637,000 bushels, as against 405,034,000 bushels actually harvested last year.

Bank Debits Up 15%

Bank debits to individual accounts outside of New York City for the week ended May 8 were 15 per cent above the total for the corresponding period last year.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for last week stands at 82.2, as against 82.1 the week before, 81.8 two weeks before, 81.5 three weeks before, and 81.7 four weeks before. It is the highest since the last week of February.

Federal Reserve Statement

The amount of Federal Reserve bank credit outstanding increased $3,000,000 during the week ended May 8. The monetary gold stock rose $7,000,000 and money in circulation by the same amount, while member bank reserves increased $37,000,000.

Fuel Injection Under Test by Bus Company

Following the development of the fuel injection system for army aircraft which was perfected jointly by the U. S. Army Air Corps and the Marvel Carburetor Co., division of Borg-Warner Corp., the Marvel organization has announced that it is now carrying on its fuel injection work in the automotive as well as the aircraft field and that one of the larger bus companies is now running tests with the Marvel fuel injector.

In aviation the new device is considered a direct step towards the Diesel principle for extremely long range airplanes of commercial type which are now under consideration for trans-oceanic service. The saving in fuel consumption is a direct means of increasing the pay load. For example, a new four motor long range plane recently placed into service between the United States and South America is required to carry approximately 8000 lb. of fuel. With the injector applied to this type of installation the 10 per cent fuel saving accounting for about 800 lb. could be used to accommodate four or five extra passengers on such a liner.

For commercial application the adaptability of the fuel injector to the use of "safety fuel" will approach the safety of the Diesel motor. Fuel injection for automobile trucks, buses and passenger cars with the same efficiency as experienced in the airplane appears in prospect for the very near future, according to engineers of the Marvel Carburetor Company.

Monetary Policy Held Aid to Motor Exports

Roosevelt's Lower Dollar Restored Foreign Trade Morgenthau Says on Radio

The monetary policies of the Roosevelt Administration were pictured as being largely responsible for the rise in automotive exports within the last 18 months by Secretary of the Treasury Morgenthau in his radio talk Monday night.

"Let us take a specific article," the Treasury head said, "such as the automobile. In 1930 we exported 238,000 cars. In 1932, with our country one of the very few remaining on the old gold standard, we exported 65,000 cars. In 1933, under the Roosevelt monetary program, our exports shot up to 107,000 cars. Last year they more than doubled; they came right back to where they had been in 1930.

"During the disastrous period of declining sales, the world still wanted American automobiles but it could not get the dollars to pay for them. Nothing startling developed in the way of foreign competition; our dollar prices had not gone up; and quality remained just as good, or improved.

"We simply had an interim during which we could not sell because the dollar was too high in relation to other world currencies; this Administration lowered the gold content of the dollar and the foreign market is being restored to our automobile manufacturers with such rapidity that the benefits are already nationwide."

Pontiac Service Men Get "Safety Service Handbook"

All Pontiac service men attending the schools conducted by the factory on safety service receive copies of the Safety Service Handbook. In addition to promoting the general idea of keeping cars in safe mechanical condition, the book covers in detail the maintenance of brakes, steering, headlamps, horns, windshield wipers and lubrication. A feature of the adjustment of the steering gear is the use of a spring balance to measure steering wheel torque. Another feature of the booklet is a page devoted to encouraging the development of friendships between Pontiac service men and filling station employees, and the passing on of Pontiac service information to them.

M. H. Cox With Zenith

M. Howard Cox, formerly automotive sales manager of Fafnir Bearing is now in charge of Automobile Radio Division of Zenith Radio Corp., with offices at 836 Maccabees Bldg., Detroit. Mr. Cox succeeds L. L. Kelsey, now special salesman for Stewart-Warner in Chicago.

Motor Orders Build Better Steel Volume

Detroit Area Finishing Mills Operations Near 90 per cent of Capacity

Cheered by better news regarding the labor situation in the automobile industry, accompanied by shipping orders from parts makers now in need of material they had previously asked to be held subject to further instructions, the steel market recovered lost ground this week. The statistical barometer aided the better feeling, the American Iron and Steel Institute's figure for this week's rate of ingot output being 43.4 per cent of capacity, as against 42.2 per cent last week. Finishing mills also operated at a better pace, those in the Detroit area running at about 90 per cent of capacity, with Youngstown district plants also staging a marked comeback.

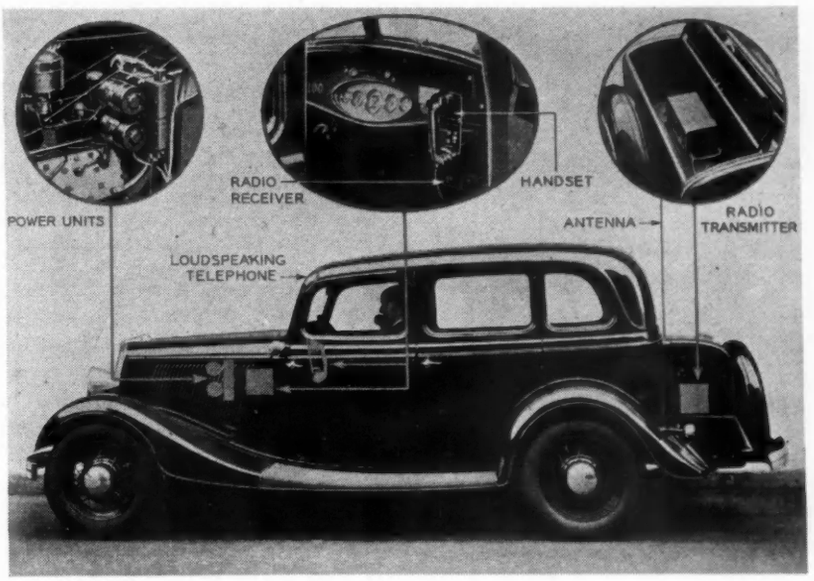
There has been very little change in the character of business coming to the steel mills, the dominant position of automotive demand being unimpaired, with better buying by tractor manufacturers emphasized here and there. There is, however, marked disparity in the demand for the different descriptions of finished steel. In spite of temporary interruptions, demand continues to keep full-finished sheet specialists occupied at a good rate and nearly all of them have comfortable backlogs.

Because of their much greater capacities, strip mills are not in quite so enviable a position, their operating rate being estimated at around 50 per cent of capacity. Cold-finished steel bars move in routine fashion. Automotive alloy steels, however, enjoy consistent and, on the whole, quite satisfactory demand. Bolts and nuts are not quite so active as they were a month ago. Manufacturing wire is in fair demand. Now that the time for filing third quarter prices is only a week away, one hears more and more that no attempts to change these upwards will be attempted.

Pig Iron—Blast furnace representatives state that the flow of foundry and malleable irons to automotive foundries is well maintained. Prices are unchanged.

Copper—Strength of foreign markets has caused the impression in some quarters that before long "Blue Eagle" prices will be lifted. In the "outside" market, where not so long ago copper was freely offered at $25 a ton below the "Blue Eagle" price, the quotation this week was 8.60 cents, delivered Connecticut, which would give the buyer an advantage of only $8 a ton over the "Blue Eagle" price. The world curtailment of production agreement provided for a 20 per cent reduction on May 1 and an additional cut of 10 per cent on June 1.

Tin—Slightly higher Sterling rates caused the market for spot Straits tin to open slightly higher this week at 50.70 cents, although in London prices declined fractionally. The trade is giving its principal attention to a fight against the processing tax contemplated in the McReynolds bill.



A two-way radio telephone system for use in police cars perfected by the Bell Telephone Laboratories. It weighs 20 lbs. and has a power of 5 watts. To talk the patrolman merely speaks into the phone and his voice automatically puts the car's transmitter on the air. The system is being installed at Evansville, Ind.

McCarty Seeks Stabilized Production by Standard Unit Output in Off-Season

E. H. McCarty, president of Nash Motors, in an interview with a representative of *Automotive Industries* amplified his recent statement concerning the possibility of stabilizing production, to a degree at least, by scheduling the off-season manufacture of standard units. This plan was tried with great success last winter at the Nash plant in Racine, Wis.

Mr. McCarty's plan is to build up a bank of parts for such units as axles and transmissions—comprising gears, shafts, etc., during the normally slack season. These parts involve machine shop operations which take time and require fine control. No assembly work is contemplated since the assembly operations are comparatively simple and also because complete units would require too much storage space.

While the size of the bank of parts is subject to many considerations unique to each manufacturer, in the case of Nash, they will figure on a supply sufficient to take care of their needs for two or three months' production at the beginning of the season when the demand is usually most heavy.

The Nash management is so well pleased with the experiment at Racine that they expect to extend this activity to the Kenosha plants this winter.

Motor Vehicle Inspection Standards to be Studied

A conference on standards of inspection of motor vehicles, called by the American Standards Association, was held May 4 in the Engineering Societies Building in New York and was attended by more than 40 representatives of industries and associations interested in the subject.

At the conclusion of the meeting, a resolution was unanimously adopted instructing P. G. Agnew, secretary of the American Standards Association, to appoint a committee to further study the question and submit a program which will be discussed at a later meeting of representatives of interested groups.

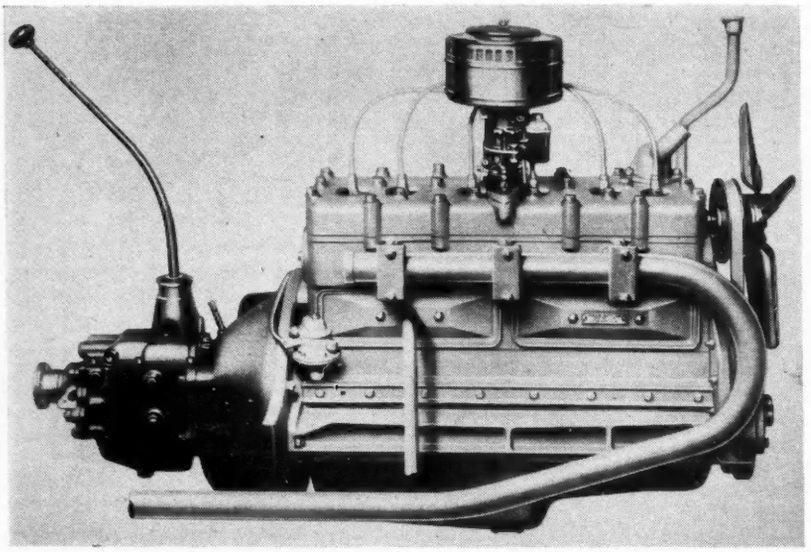
Chevrolet Offering High Wheels on Standard Cars

To provide extra road clearance for cars to be used largely on unimproved highways, as in the rural mail delivery service, the Chevrolet Motor Company now offers new Standard models carrying, as optional equipment, 19-in. wheels, two inches larger in diameter than the regular equipment. The high-clearance wheels are of wire-spoke construction, similar to the regular 17-in. wheels.

New Standard models equipped with 19-in. wheels, which carry 5.25 tires, have road clearance of 9⅝ in. front and 9⅜ in. rear, or 1 in. greater front and rear, than with the regular wheels.

Father Hubbard Selects Johnson "Sea-Horses"

Father Hubbard, widely known as "The Glacier Priest," recently visited the Johnson factory in Waukegan where he selected two of the new Model K-75 Sea-Horses for his next trip into Alaska.



Right side of Nash "400" power plant. Manifolds are cored into the block and cylinder head.

Nash Adds Steel Top Six

(*Continued from page* 653)

cored in the water-cooled head and the exhaust in the side of the block, while the oil manifold is cored in the lower end of the crankcase. No exhaust heat is applied to the mixture from the down-draft Stromberg carburetor mounted on the head.

The crankshaft is carried in seven main bearings which are of the steel backed babbitt interchangeable type as are those in the connecting rods. Pistons are of aluminum alloy with Invar struts and split skirts, and they carry four rings. Sealed pressure cooling operating at about 7 lb. per sq. in. pressure is used, control being provided by a two-way valve built-in as part of the radiator filler cap. Electrical equipment is Auto-Lite with the 120 amp.-hr. battery of USL manufacture.

The roomy new all-steel bodies are secured to the frame by brackets, each with a single large bolt. The top of the cowl, windshield pillars and forward portion of the roof as far back as the center door pillar, are formed in one stamping. Each rear side quarter of the body and side roof crown panel as far forward as the center door pillar, is also in one piece. The rear half of the top and the entire back panel of the body make up another huge stamping. These stampings are welded into a unit.

The fine riding qualities of the new cars are credited to the synchronized springing and the 50-50 distribution of weight. The springs are fitted with Silenite damperleaves and are rubber covered.

The car will be announced to the public this week-end in large space in 900 newspapers and on billboards in 338 key cities and towns. Full-page advertisements will be used in three national weeklies.

The new car has been in production for several weeks and distributors and dealers will have display models when the announcement is made.

A complete description of this new car will appear in next week's issue.

Senate Votes to Extend NRA

(*Continued from page* 654)

tional issues would be available for the guidance of Congress.

The prevailing view in Washington, since the Senate's adoption of the Clark resolution, is that NRA will come to a definite end April 1, 1936. Even administration supporters, who have consistently stood out for passage of the Administration bill extending NRA for two years, incline to the belief that it will be impossible to break the Senate's adherence to the Clark measure. However, the House Ways and Means Committee is preparing to report out the Administration Bill and, as indicated by Speaker Byrns and other Administration men, there is every indication it will pass the House. In this event the matter will go to conference.

When the House and Senate conferees meet it is felt there is grave doubt the upper branch of Congress will yield to the lower on the Administration measure. Even should the Senate's representatives give way to the House, it is believed doubtful the Senate itself would agree to passage of the two year extension bill. There also appears to be some indication that the Administration, seeing the tide turn against NRA, is preparing to accept defeat of its measure and agree to the Clark resolution. There is a growing belief that Senatorial opponents of NRA will resort to a filibuster until the Recovery Act normally expires June 16 rather than submit to the Administration measure.

F.D.R. Approves 7 Proposals by NIRB to Extend NRA

WASHINGTON, May 16—At a White House conference today with members of the National Industrial Recovery Board, President Roosevelt approved seven recommendations which had been unanimously adopted by the board for legislative action to extend NRA. The recommendations provide for a two year extension; three to six months for revision of codes; additional guidance and authority for administrative action; limitation of NRA jurisdiction to industries engaged in or substantially affecting interstate commerce; provision for voluntary codes and adequate authority for imposition of limited codes; definite authority and standards of NRA to prevent unfair competitive practices, especially those tending to monopoly and destruction of small enterprise; further definition of methods of code making and enforcement.

In declaring for a two year extension the board said that period is necessary to obtain the cooperation of industry and in the formulation of codes with assurances to management and labor of reasonably permanent conditions.

Perfex Radiator Elects Hansen Vice-President

Frederick D. Hansen, formerly secretary and general manager of the Federal Pressed Steel Co., Milwaukee, has been elected a director and executive vice-president of the Perfex Radiator Co., Milwaukee, it is announced by Julius K. Luthe, president. Before joining Federal Mr. Hansen was associated with Eddystone Ammunition Co., a division of Baldwin Locomotive Works. Perfex manufactures cooling systems for passenger and commercial cars, tractors, etc., automobile heaters, radio parts, unit heaters, and is developing a new line of temperature controls.

E. M. Rauh With Thermoid

The Thermoid Company of Trenton, N. J., reports the affiliation of Edgar M. Rauh with its subsidiary rubber company in a sales engineering capacity in the V-belt division, including both automotive fan belts and fractional horse power belts. Mr. Rauh formerly was president of Sterling Rubber Products Manufacturing Co., Inc. of Philadelphia. Mr. Rauh has announced that the Sterling Rubber Products Manufacturing Company will be dissolved.

Code Change Suggestions Asked by Wholesale Group

Anticipating the necessity for changes in the Wholesale Automotive Code following the enactment of new NRA legislation, the code authority has asked wholesalers for suggestions as to what changes or additions should be made in the code to have it reflect the desires of the trade in general.

Specifically, the code authority asks wholesalers for data on the possibilities of shorter hours and/or higher minimum wages, the designation of code provisions which should be eliminated, and the extent of interstate business done by automotive wholesalers.

Proportional Representation Urged by Moley in Article on Union Problems

Calling attention to the fact that legalization of majority rule as provided in the Wagner bill would set aside "the arrangements now functioning in the motor and rubber industries, based upon the wise suggestion of the President," Raymond Moley, editor of *Today* and Administration advisor, says in an article in that publication that "some effort must be made to use the technique of proportional representation. . . ."

At the same time Mr. Moley warns the American Federation of Labor that it is maneuvering itself into a position which may lead to disaster by its increasing dependence on political action and by its failure to face realistically the dilemmas forced upon it by the times.

Discussing the Wagner bill, Mr. Moley says that balance is the keynote of its preamble. This goal, equality of bargaining power, he regards as chimerical. "I am reminded," he says, "that we have two industries in which there is what we might call an equilibrium of bargaining power. They are building construction and railroads. There are people who say that labor has the edge in bargaining power in these industries. Yet neither of them, this year, is as active or as healthy as the automobile industry, where the bargaining power of the employees nowhere near meets the tests the A. F. of L. or the Wagner bill lays down. There is equilibrium on the railroads; there is not equilibrium in the motor industry. Still, railroad labor is not happy, it is not prosperous, and its brotherhoods feel the need of further legislation for their benefit.

Suggesting that the political machinery labor seeks to set up might prove to be a broken crutch with a conservative administration in power, Mr. Moley says: "The search for ever closer relationships with government, such as that contemplated in the Wagner bill, would provide the machinery for the control of labor by a party more conservative than the one now in power. The present liberal Democratic party, which recognizes the need of a strong labor movement, ought itself to take care lest it permit labor to assume a yoke from which it might never free itself.

"During the hitherto unsuccessful campaign to organize the automobile industry, anyone could see that Mr. Green's activity in Washington was regarded as more important than his speeches in Michigan, although it should have been apparent that no amount of legislation in Washington could very well compensate labor for its inability to gain headway in a modern industry like automobiles.

"The Wagner bill in its present form (May 1) seems like a further means of binding the labor movement to politics and government. Possibly it is one step in the road to the Federation's becoming that quasi-public, demi-governmental agency which Lewis Lorwin suspected was coming into existence . . . two years ago . . . if the Federation is ever to break away from reliance upon government, the time is now. This is the last call."

Pointing to the power the Wagner bill would give the National Labor Relations Board to determine appropriate units for collective bargaining, Mr. Moley indicates that the board would have the authority to resolve arguments over craft and vertical unionism. He admits that the Federation may recognize this possibility and welcome it as the best means of settling present controversies.

Arlen, Movie Star Will Be DePaolo's Mechanic

Richard Arlen, motion picture actor, will ride as mechanic in the Ford V-8 Special in which Pete DePaolo will attempt his comeback in the Memorial Day 500 mile classic at Indianapolis. If the DePaolo entry is successful in its trials and is in the starting line-up it will be the first time a Hollywood star has actually participated in the famous race. Several actors have entered cars and been interested in entries, including Harry Hawkes, the director, and Monroe Owsley. The late "Wally" Reid once entered a car with himself as driver, but his contract with the film producers prevented him from participating.

Russell Beg Joins GM

Russell Begg, formerly chief engineer of Midland Steel Products Co., Cleveland, has joined the central organization of General Motors Corp. on special engineering assignments.

Order for 37 Buses

The St. Louis Public Service Co. has placed orders for 37 single-deck buses priced between $10,000 and $11,000 apiece. Contracts have been awarded to GM, White, Ace, and Twin Coach.

New Auburn 7-Pass. Sedan

Auburn has added a seven-passenger sedan on its 127-in. wheelbase, eight-cylinder chassis. The chassis is equipped with heavier rear springs to take care of additional weight.

H. P. Valentine

Formerly Dodge city manager at Los Angeles, who has been made manager of a new region which includes Minnesota, the Dakotas, and parts of Wisconsin, Iowa, Wyoming and Montana.

Nash, Ltd., Organized for Sales, Service in England

Nash, Ltd., has been organized in London to distribute, sell and service Nash cars in Great Britain. The new company is reported to have a nominal capital of £1,000 and is understood to have sufficient working capital to insure adequate marketing and publicity facilities.

Dodge Adds 2 Models

The Dodge division of Chrysler Motors announces two additional models—one a seven-passenger sedan, the other a five-passenger caravan sedan, listing at $995 each. Both are mounted on a 128-in. wheelbase chassis, 12 inches longer than the 116-in. standard Dodge chassis of 1935. The Caravan model has built-in trunk. The seven-passenger sedan may also be had with rear mounted trunk rack.

Olds Equipping Cars With Oil Bath Air Cleaners

To meet the new problem arising because of dust storms in the Southwest, Oldsmobile is equipping all cars shipped into the areas most affected with oil bath air cleaners.

CALENDAR OF COMING EVENTS

SHOWS

Machine Tool Show—Cleveland..Sept. 11-21
New York Automobile Show, New York, Nov. 2-9
Detroit Automobile Show.....Nov. 9-16
Buffalo Automobile Show .....Nov. 9-16
Automotive Service Industries Show—Atlantic City .....Dec. 9-13

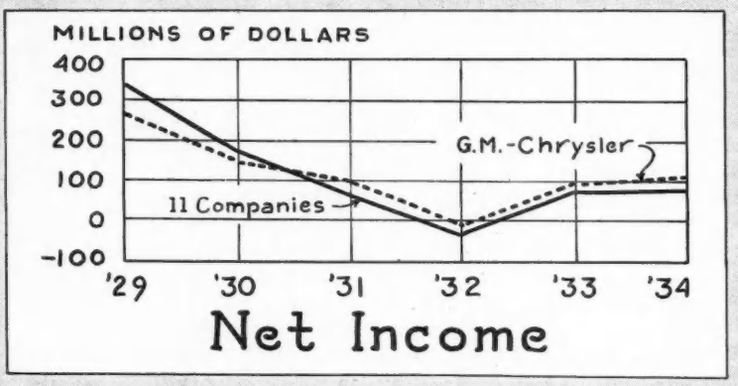
CONVENTIONS AND MEETINGS

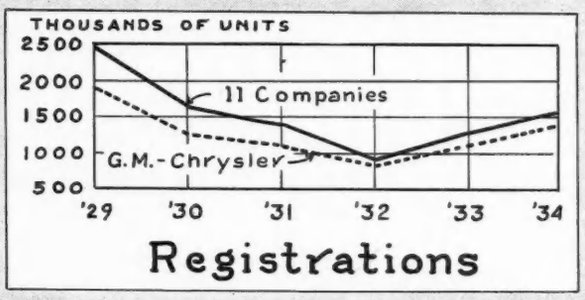
Automotive Trade Assoc. Managers Mid-Year Meeting, Washington, D. C. .....May 22-24
Automotive Engine Rebuilders Assoc.—Indianapolis ....May 27-30
S.A.E. Summer Meeting—White Sulphur Springs, Va. .....June 16-20
American Society for Testing Metals, Detroit .....June 24-28
American Transit Assoc., Bus Division, Atlantic City .....Sept. 23
National Assoc. Sales Finance Cos.—White Sulphur Springs.....Sept. 26-28
American Society for Metals, Annual Meeting—Chicago .....Sept. 30-Oct. 4
National Safety Council, Louisville, Ky. .....October 14-18
American Gas Association—Atlantic City .....Oct. 14-18
American Petroleum Institute—Los Angeles .....Nov. 11-14
National Industrial Traffic League—Chicago .....Nov. 20-21

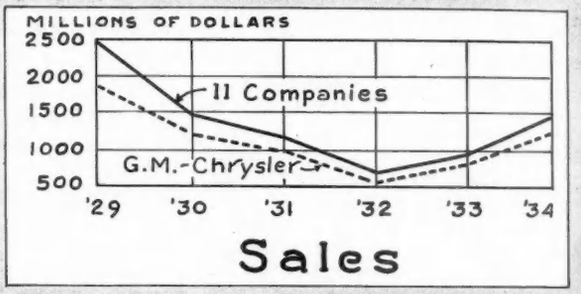
RACES

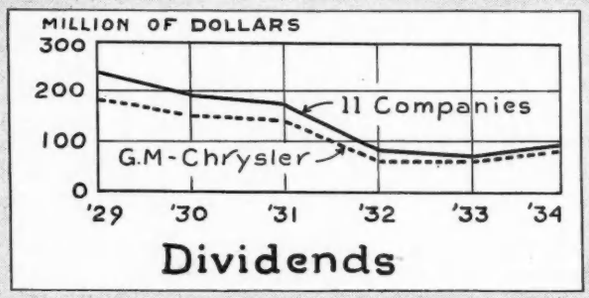
Race—Indianapolis Race, Indianapolis, May 30

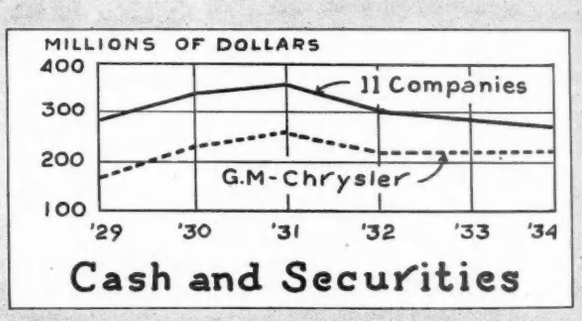
52% Increase in Volume in '3

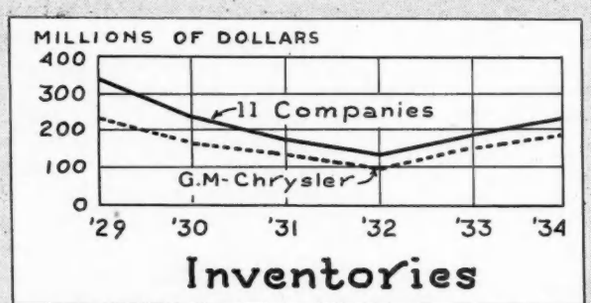


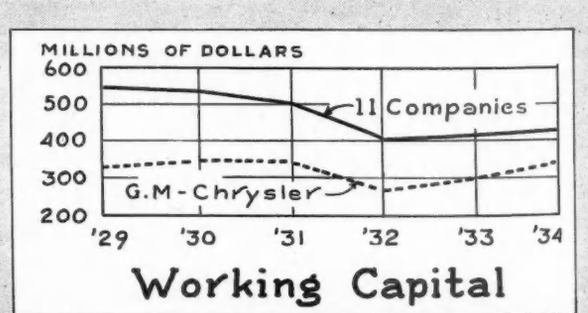


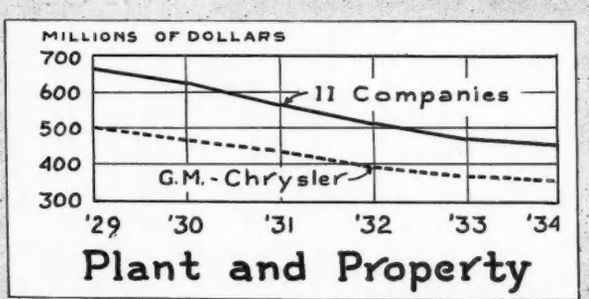


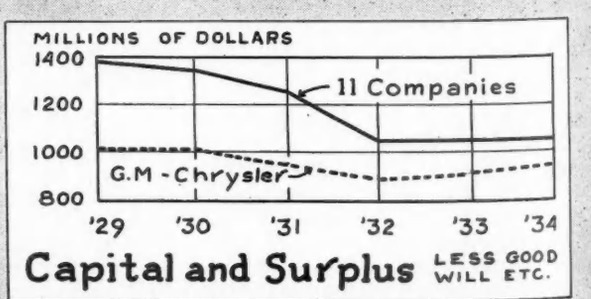












'34 Brings 11 Car Makers 3% Gain in Net Earnings

by Don Blanchard
and Marcus Ainsworth

ALTHOUGH profits normally expand faster than volume, marked increases in the sales of motor vehicle manufacturers in 1934 failed to bring any commensurate improvements in net earnings, primarily because prices could not be advanced sufficiently to offset rising costs without stalling the market.

In the accompanying tables the financial consequences of the operations of 11 companies during the 1929-1934 period. These companies include substantially all of the major producers except Ford and Studebaker. For the former, 1934 figures are not yet released, while for the latter comparative data are not available due to the reorganization recently consummated.

The 11 companies increased their dollar volume 52 per cent in 1934 as compared with 1933, but net earnings show a gain of but 3 per cent. Dividends were up 16 per cent, while working capital was 2 per cent larger.

In contrast with 1933, when only Mack, Packard and Reo shared in the expansion in dollar volume, last year only Packard of the nine independent companies showed a loss in sales. As a result, 1934 volume of the nine independents was up 75 per cent as compared with an increase of 49 per cent for General Motors and Chrysler combined. This phenomenal expansion in sales, however, did not bring with it any proportionate improvement in earnings. On the contrary, the deficit sustained by the nine companies was 42 per cent larger than in the previous year.

Mack was the only company in the group to report black figures for 1934, although Hudson, Reo and White succeeded in reducing their deficits under 1933. Chrysler and General Motors both enjoyed substantial increases in sales, but the former had smaller profits in 1934 than in 1933, while the latter registered only a small increase. Combined, these two automotive giants had a 10 per cent increase in earnings on a 49 per cent increase in sales.

Stockholders in the 11 companies received 16 per cent more dividends in 1934 than in the previous year, but the increase was due entirely to Chrysler and General Motors, whose disbursements were 17 per cent larger. As a group the owners of the nine independent companies received 11 per cent less on their investment.

In the six years covered by the accompanying tables the 11 companies earned $713,000,000, which amounted to 9.7 per cent on their average net worth (capital stock + surplus — intangibles). During this period they furnished stockholders with $819,000,000 of purchasing power in the form of dividends, amounting to 11.1 per cent on net worth.

Chrysler and General Motors together during this period earned $708,000,000, which was 12.5 per cent on their combined average net worth, and paid out $688,000,000 in dividends, or 12.1 per cent. The nine independents earned $5,000,000 in the period, amounting to 0.3 per cent on their net worth. They paid out $131,000,000 in dividends, or 7.8 per cent on average net worth. It should be pointed out that the bulk of the dividend payments made by independents were made in 1929 and 1930 and that in the last three years their aggregate disbursements to stockholders have totaled only $15,000,000. These data on earnings emphasize the inability of the industry as a whole to absorb further artificial increases in costs until the public is willing to buy cars in volume at higher prices than at present.

The 11 companies had 2 per cent more working capital at the end of 1934 than a year earlier, but again Chrysler and General Motors, with a gain of 10 per cent, were responsible for the group improvement, since the nine independents together suffered an 18 per cent loss of working capital.

Net Income and Dividends as Per Cent of Net Worth

(Net Worth = Capital Stock + Surplus — Intangibles)

	1929	1930	1931	1932	1933	1934
Eleven Companies						
Net Income	24.5%	12.5%	6.7%	—3.5%	7.0%	7.2%
Dividends	16.8	14.2	13.2	6.8	6.3	7.3
Chrysler and General Motors						
Net Income	26.6	15.3	10.2	—1.1	10.5	11.2
Dividends	17.8	15.0	15.0	7.7	7.3	8.5
Nine Companies						
Net Income	18.7	4.3	—5.1	—11.6	—7.2	—11.5
Dividends	14.2	11.8	7.4	3.7	1.3	1.5

U. S. Registrations of New Vehicles

	1929	1930	1931	1932	1933	1934
General Motors	1,491,000	1,048,000	937,000	522,000	753,000	920,480
Chrysler Corp.	388,900	245,290	243,530	199,850	413,700	480,570
Total	1,879,900	1,293,290	1,180,530	721,850	1,166,700	1,401,050
Auburn	19,300	13,370	31,130	11,980	5,040	5,540
Graham	62,600	30,650	19,320	12,855	10,130	12,890
Hudson	262,900	95,390	62,100	37,420	38,780	60,335
Hupp	45,900	24,720	17,530	10,790	6,730	6,570
Mack	6,800	4,900	3,000	1,425	1,650	1,830
Nash	108,800	51,950	39,600	20,230	11,350	24,620
Packard	46,200	28,800	16,350	11,055	9,080	6,550
Reo	30,900	18,040	12,000	7,060	6,670	8,890
White	6,100	4,400	2,600	2,140	1,380	3,960
Total	589,500	272,220	203,630	114,955	90,810	131,185
Total	2,469,400	1,565,510	1,384,160	836,805	1,257,510	1,532,235

Sales Volume (000 Omitted)

	1929	1930	1931	1932	1933	1934
General Motors	$1,504,404	$983,375	$808,841	$432,312	$569,011	$843,808
Chrysler Corp.	375,033	207,789	183,805	136,547	238,676	362,255
Total	$1,879,437	$1,191,164	$992,646	$568,859	$807,687	$1,206,063
Auburn	37,551	24,114	37,086	12,845	5,360	10,332
Graham	64,490	27,777	16,499	10,491	8,333	11,595
Hudson	201,018	78,095	38,236	25,862	23,521	52,568
Hupp	52,506	23,445	.....	8,751	6,119	7,196
Mack	57,227	43,644	27,621	13,218	15,744	18,346
Nash	.....	.....	35,928	15,331	8,984	19,671
Packard	†107,542	57,690	29,987	15,516	19,230	14,619
Reo	48,011	29,671	17,044	9,096	10,260	13,836
White	48,653	36,533	23,517	17,117	13,615	20,540
Total	$564,492	$297,524	$189,990	$104,145	$96,063	$168,503
Total	$2,443,929	$1,488,688	$1,182,636	$673,004	$903,750	$1,374,766

Totals do not include Hupp and Nash. † Year ended August 31, 1929.

Net Income After Interest, Taxes and Depreciation (000 Omitted)

	1929	1930	1931	1932	1933	1934
General Motors	$245,970	$153,766	$96,877	$165	$83,214	$94,769
Chrysler Corp.	21,902	234	1,469	*d11,254*	12,129	9,535
Total	$267,872	$154,000	$98,346	*$d11,089*	$95,343	104,304
Auburn	3,603	1,018	3,580	*d976*	*d2,308*	*d3,642*
Graham	*d1,464*	*d4,969*	*d4,736*	*d2,811*	67	*d475*
Hudson	11,595	365	*d1,991*	*d5,429*	*d4,410*	*d3,239*
Hupp	3,469	*d923*	*d4,249*	*d4,515*	*d1,778*	*d4,398*
Mack	6,841	2,008	*d3,032*	*d1,480*	*d948*	17
Nash	18,014	7,601	4,808	1,030	*d1,189*	*d1,625*
Packard	25,183	9,034	*d2,909*	*d6,824*	107	*d7,291*
Reo	1,074	1,000	*d2,749*	*d3,879*	*d2,588*	*d958*
White	2,548	*d474*	*d3,235*	*d3,619*	*d3,169*	*d1,401*
Total	$70,863	$14,620	*d$14,513*	*d$27,502*	*d$16,216*	*d$23,012*
Grand Total	$338,735	$168,620	$83,833	*d$38,591*	$79,127	$81,292

d Deficit

Common and Preferred Dividends (000 Omitted)

	1929	1930	1931	1932	1933	1934
General Motors	$165,954	$139,973	$139,876	$63,199	$63,005	$73,622
Chrysler Corp.	13,336	11,065	4,412	4,390	4,304	5,432
Total	$179,290	$151,038	$144,288	$67,589	$67,309	$79,054
Auburn	645	764	824	835	553	223
Graham	372	362	329	30	.....	.....
Hudson	8,180	6,518	1,597	.....	.....	.....
Hupp	2,760	2,239	.....	.....	.....	.....
Mack	4,534	4,163	1,680	692	665	650
Nash	16,380	13,650	9,555	4,095	1,985	1,985
Packard	17,234	9,741	6,746	.....	.....	.....
Reo	2,400	1,600	772	.....	.....	.....
White	1,000	1,503	355	3,125	.....	.....
Total	$53,505	$40,540	$21,858	$8,777	$3,203	$2,858
Grand Total	$232,795	$191,578	$166,146	$76,366	$70,512	$81,912

Only Graham had outstanding preferred stock.

Cash and Securities (000 Omitted)

	1929	1930	1931	1932	1933	1934
General Motors	$127,352	$179,037	$205,029	$172,781	$177,304	$186,967
Chrysler Corp.	38,706	41,644	50,233	42,603	37,370	32,416
Total	$166,058	$220,681	$255,262	$215,384	$214,674	$219,383
Auburn	2,082	4,716	8,410	5,138	3,983	1,115
Graham	6,180	2,995	1,482	528	707	523
Hudson	17,145	13,983	8,909	4,199	2,680	2,576
Hupp	10,156	9,913	7,096	4,904	3,585	1,035
Mack	1,899	3,116	7,041	9,768	7,766	5,062
Nash	42,011	38,095	36,550	32,135	29,915	27,257
Packard	17,910	18,612	13,995	13,387	15,161	12,396
Reo	9,563	8,015	6,159	5,972	1,480	2,427
White	10,657	9,808	8,630	7,762	5,836	2,508
Total	$117,603	$109,253	$98,272	$83,793	$71,113	$54,899
Grand Total	$283,661	$329,934	$353,534	$299,177	$285,787	$274,282

Inventories (000 Omitted)

	1929	1930	1931	1932	1933	1934
General Motors	$188,473	$136,299	$106,471	$75,479	$115,585	$138,598
Chrysler Corp.	38,102	26,055	22,104	18,377	34,557	37,534
Total	$226,575	$162,354	$128,575	$93,856	$150,142	$176,132
Auburn	8,754	5,158	4,454	4,011	2,780	3,194
Graham	7,343	5,430	2,555	1,410	1,052	1,289
Hudson	13,467	6,844	4,476	3,615	4,492	4,562
Hupp	8,481	5,859	4,271	2,115	1,736	1,495
Mack	20,306	15,967	10,369	9,047	8,694	8,484
Nash	5,246	2,768	1,348	1,023	2,077	2,138
Packard	13,624	11,092	7,874	5,763	5,451	4,777
Reo	10,051	6,675	5,200	3,454	3,310	3,905
White	15,566	13,992	9,219	8,397	7,981	8,848
Total	$102,838	$73,785	$49,766	$38,835	$37,573	$38,692
Grand Total	$329,413	$236,139	$178,341	$132,691	$187,715	$214,824

Current Assets (000 Omitted)

	1929	1930	1931	1932	1933	1934
General Motors	$368,961	$364,817	$358,503	$279,978	$317,515	$365,844
Chrysler Corp.	90,313	74,029	76,320	65,682	74,640	87,089
Total	$459,274	$438,846	$434,823	$345,660	$392,155	$452,933
Auburn	13,327	12,270	14,401	10,898	8,549	5,681
Graham	14,554	9,159	4,647	2,163	1,891	1,960
Hudson	34,474	25,133	14,749	8,666	7,533	7,883
Hupp	19,882	16,173	11,926	7,283	5,661	2,874
Mack	44,293	37,196	32,225	29,205	26,695	23,378
Nash	53,141	43,388	39,787	34,145	33,191	30,156
Packard	38,080	33,969	24,519	20,450	22,252	18,656
Reo	22,688	17,385	12,434	9,984	7,887	7,147
White	32,197	27,779	23,460	19,411	16,784	15,096
Total	$272,636	$222,452	$178,148	$142,205	$130,433	$112,831
Grand Total	$731,910	$661,298	$612,971	$487,865	$522,588	$565,764

Current Liabilities (000 Omitted)

	1929	1930	1931	1932	1933	1934
General Motors	$117,673	$83,780	$84,587	$57,822	$76,183	$90,199
Chrysler Corp.	18,928	11,455	11,328	16,395	21,223	37,686
Total	$136,601	$95,235	$95,915	$74,217	$97,406	$127,885
Auburn	3,296	2,831	1,924	330	618	649
Graham	2,984	3,032	2,619	1,297	995	1,463
Hudson	8,271	5,301	3,590	2,200	4,461	6,138
Hupp	2,541	1,728	1,715	1,074	1,107	676
Mack	7,209	2,377	1,632	1,667	1,905	1,784
Nash	8,860	5,758	2,710	1,145	2,312	1,407
Packard	13,204	5,993	3,123	2,325	2,330	4,695
Reo	2,717	1,663	1,398	849	955	1,106
White	3,176	1,910	1,353	1,096	1,598	1,369
Total	$52,258	$30,593	$20,064	$11,983	$16,281	$19,287
Grand Total	$188,859	$125,828	$115,979	$86,200	$113,687	$147,142

	Working Capital (000 Omitted)						Plant and Property—Depreciated (000 Omitted)					
	1929	1930	1931	1932	1933	1934	1929	1930	1931	1932	1933	1934
General Motors	$251,288	$281,038	$273,916	$222,156	$241,332	$275,646	$415,785	$395,374	$362,628	$328,274	$303,765	$293,238
Chrysler Corp.	71,385	62,574	64,992	49,286	53,417	49,402	83,624	74,173	65,513	61,697	60,409	59,356
Total	$322,673	$343,612	$338,908	$271,442	$294,749	$325,048	$499,409	$469,547	$428,141	$389,971	$364,174	$352,594
Auburn	10,031	9,439	12,477	10,568	7,930	5,032	7,075	7,810	7,834	7,343	6,732	6,216
Graham	11,570	6,127	2,028	866	896	498	13,987	12,907	11,843	6,640	6,340	5,020
Hudson	26,203	19,832	11,159	6,466	3,072	1,745	33,276	30,173	29,338	25,614	24,440	22,567
Hupp	17,342	14,445	10,211	6,209	4,554	2,198	16,407	13,828	11,315	8,463	7,843	5,928
Mack	37,084	34,819	30,593	27,538	24,790	21,594	20,506	19,366	17,184	16,643	16,091	16,045
Nash	44,281	37,630	37,077	33,000	30,879	28,748	9,161	8,343	6,819	6,029	5,413	4,376
Packard	24,876	27,976	21,396	18,125	19,922	13,961	37,870	35,911	33,442	31,319	29,117	27,842
Reo	19,972	15,722	11,036	9,135	6,932	6,042	10,689	10,335	9,663	4,646	3,899	3,893
White	29,021	25,870	22,107	18,315	15,186	13,727	9,634	9,187	8,545	7,942	7,407	10,092
Total	$220,380	$191,860	$158,084	$130,222	$114,161	$93,545	$158,605	$147,860	$135,963	$114,639	$107,282	$101,979
Grand Total	$543,053	$535,472	$496,992	$401,664	$408,910	$418,593	$658,014	$617,407	$564,124	$504,610	$471,456	$454,573

	Capital Stock (000 Omitted)						Surplus (000 Omitted)					
	1929	1930	1931	1932	1933	1934	1929	1930	1931	1932	1933	1934
General Motors	$571,924	$622,537	$622,537	$622,537	$622,537	$622,537	$380,560	$344,265	$301,266	$238,232	$248,961	$270,109
Chrysler Corp.	73,756	73,263	73,122	21,847	21,807	21,729	54,087	42,763	39,679	52,695	60,043	64,094
Total	$645,680	$695,800	$695,659	$644,384	$644,344	$644,266	$434,647	$387,028	$340,945	$290,927	$309,004	$334,203
Auburn	7,993	9,045	9,849	10,714	10,946	10,946	6,210	5,683	7,596	4,859	1,738	*d1,930*
Graham	14,004	13,826	13,690	3,788	3,783	3,036	8,570	3,218	*d1,883*	2,071	2,199	2,553
Hudson	19,958	19,958	19,958	19,958	19,958	19,958	38,726	30,266	20,146	11,686	7,276	4,036
Hupp	14,754	15,121	13,319	13,291	13,291	13,291	18,942	13,807	9,443	2,013	236	*d8,407*
Mack	3,900	3,940	3,940	3,381	3,337	3,137	54,761	52,110	47,397	41,490	39,744	38,387
Nash	13,887	13,887	13,887	13,887	13,887	13,887	39,771	33,722	29,123	26,301	23,793	20,466
Packard	50,000	50,000	50,000	40,000	40,000	40,000	15,584	14,877	5,223	8,398	8,905	1,614
Reo	20,000	20,000	18,105	9,000	9,000	9,000	10,834	7,296	3,874	5,284	2,718	1,740
White	40,000	40,000	32,500	31,250	31,250	31,250	8,678	6,991	7,979	2,088	*d1,081*	*d2,864*
Total	$184,496	$185,777	$175,248	$145,269	$145,452	$144,505	$202,076	$167,970	$128,958	$104,190	$85,528	$62,195
Grand Total	$830,176	$881,577	$870,907	$789,653	$789,796	$788,771	$636,723	$554,998	$469,903	$395,117	$394,532	$396,398

d Deficit

	Capital and Surplus (000 Omitted)						Good Will, Patents, Etc. (000 Omitted)					
	1929	1930	1931	1932	1933	1934	1929	1930	1931	1932	1933	1934
General Motors	$952,484	$966,802	$923,803	$860,769	$871,498	$892,646	$50,680	$51,949	$51,939	$51,839	$51,838	$51,838
Chrysler Corp.	127,843	116,026	112,801	74,542	81,850	85,823	25,000	25,000	25,000	.....	.....	.....
Total	$1,080,327	$1,082,828	$1,036,604	$935,311	$953,348	$978,469	$75,680	$76,949	$76,939	$51,839	$51,838	$51,838
Auburn	14,203	14,728	17,445	15,573	12,684	9,016	.....	.....	.....	.....	.....	.....
Graham	22,574	17,044	11,867	5,859	5,982	5,589	.....	.....	.....	.....	.....	.....
Hudson	58,684	50,224	40,104	31,644	27,234	23,994	.....	.....	.....	.....	.....	.....
Hupp	33,696	28,928	22,762	15,304	13,527	10,884	.....	.....	.....	.....	.....	.....
Mack	58,661	56,050	51,337	44,871	43,081	41,524	2,438	2,438	2,438	2,438	2,438	2,438
Nash	53,658	47,609	43,010	40,188	37,680	34,353	.....	.....	.....	.....	.....	.....
Packard	65,584	64,877	55,223	48,398	48,905	41,614	.....	.....	.....	.....	.....	.....
Reo	30,834	27,296	21,979	14,284	11,718	10,740	.....	.....	.....	.....	.....	.....
White	48,678	46,991	40,479	33,338	30,169	28,986	5,389	5,389	5,389	5,389	5,389	5,389
Total	$386,572	$353,747	$304,206	$249,459	$230,980	$206,700	$7,827	$7,827	$7,827	$7,827	$7,827	$7,827
Grand Total	$1,466,899	$1,436,575	$1,340,810	$1,184,770	$1,184,328	$1,185,169	$83,507	$84,776	$84,766	$59,666	$59,665	$59,665

	Capital and Surplus less Good Will, Etc. (000 Omitted)						Funded Debt—Bonds, Debentures, Etc. (000 Omitted)					
	1929	1930	1931	1932	1933	1934	1929	1930	1931	1932	1933	1934
General Motors	$901,804	$914,853	$871,864	$808,930	$819,660	$840,808	$1,992	.....	.....	.....	.....	.....
Chrysler Corp.	102,843	91,026	87,801	74,542	81,850	85,823	49,765	$47,583	$44,411	$42,331	$40,027	$30,150
Total	$1,004,647	$1,005,879	$959,665	$883,472	$901,510	$926,631	$51,757	$47,583	$44,411	$42,331	$40,027	$30,150
Auburn	14,203	14,728	17,445	15,573	12,684	9,016	512	397	359	131	98	.....
Graham	22,574	17,044	11,867	5,859	5,892	5,589	3,125	2,900	2,325	1,805	1,567	1,336
Hudson	58,684	50,224	40,104	31,644	27,234	23,994	.....	.....	.....	.....	.....	.....
Hupp	33,696	28,928	22,762	15,304	13,527	10,884	.....	.....	.....	.....	.....	.....
Mack	56,223	53,612	48,899	42,433	40,643	39,086	2,200	2,000	1,800	541	.....	.....
Nash	53,658	47,609	43,010	40,188	37,680	34,353	.....	.....	.....	.....	.....	.....
Packard	65,584	64,877	55,223	48,398	48,905	41,614	.....	.....	.....	.....	.....	.....
Reo	30,834	27,296	21,979	14,284	11,718	10,740	.....	.....	.....	.....	.....	.....
White	43,289	41,602	35,090	27,949	24,780	23,597	42	39	.....	.....	.....	949
Total	$378,745	$345,920	$296,379	$241,632	$223,153	$198,873	$5,879	$5,336	$4,484	$2,477	$1,665	$2,285
Grand Total	$1,383,392	$1,351,799	$1,256,044	$1,125,104	$1,124,663	$1,125,504	$57,636	$52,919	$48,895	$44,808	$41,692	$32,435

Quality Control Featured in C

WHEN a compact manufacturing plant like the Borg & Beck Co. gets out a total of 842,000 clutches in one year as it did in 1934, and 120,000 in the month of April, 1935, its method of doing the job becomes a matter of more than passing interest. With this in mind we made it a point to select a few operations that should have a general appeal to production executives.

Just a brief visit through the plant convinced us that apart from ingenious mechanical set-ups and several very tricky assembly stations, the most important matter to record is the way quality control is carried out at every step. By the time the clutches have reached the sub-assembly and final assembly stages they conform rigidly to specifications. Lest this be taken simply as a friendly statement, may we say that it is based on the fact that returns from the customers are just about nil.

Apropos of this point consider the combination driven plate inspection fixture, Fig. 1, in which the driven plates are checked 100 per cent for vibration damper characteristics and also for runout or drag of the plate exactly in the same manner as when installed in a clutch. In operation the driven plate is first mounted in the position shown, the hub being closely fitted to a spline shaft which extends through the head stock of the fixture. The tail stock, forming the pressure plate, is then brought up against the facing of the disc by an air cylinder exerting the same pressure used on that particular sized clutch, then with the air pressure applied, the cam at the left, which supports the torque arm attached to a spline shaft, is rotated, thus putting the weight load on the torque arm and applying a torsional load between the facing portion and the hub portion of the disc. The amount of deflection is read by the indicator on the left.

For the next operation the inspector releases the air pressure and withdraws the pressure plate from the disc a definite amount, in most cases 0.060 in., and then rotates the disc by means of the hand wheel mounted in the central portion of the head stock. This hand wheel is connected to the spline shaft driving the disc through a friction arrangement that insures proper release in the clutch if the driven plate turns when hand wheel is rotated.

However, there is an aspect of the work of this company that should be of real interest to engineers and metallurgists. We refer to the continuous program of research and development not only in clutch design but in the study of clutch facing materials. Thus, Fig. 2 shows the inertia wear test machine which provides a rapid estimate of the life of new or unknown facing materials. This equipment is unique and its results are made available to users of the product.

As shown in Fig. 2 the machine consists of a 50-hp. electric motor con-

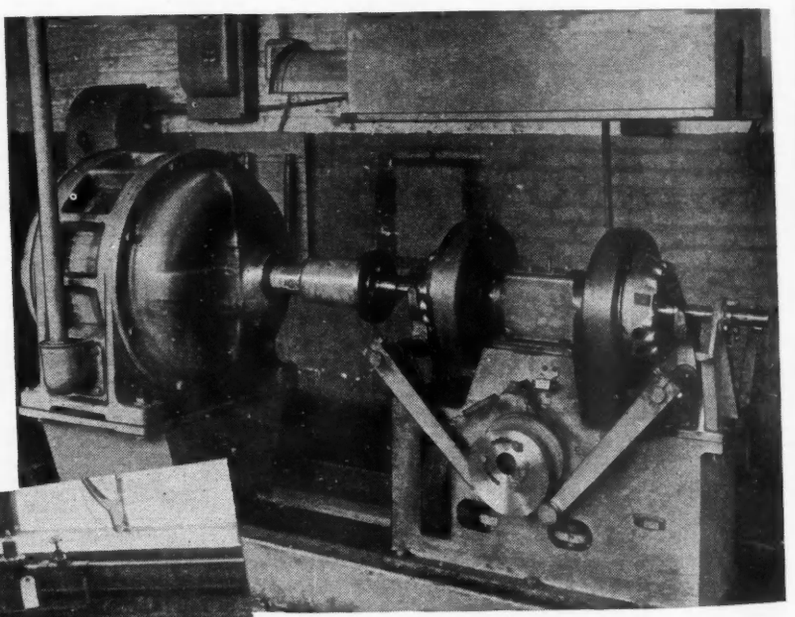


Fig. 2 (Above)—Inertia wear testing machine tells quickly and unerringly whether a new clutch facing material will stand up in modern service

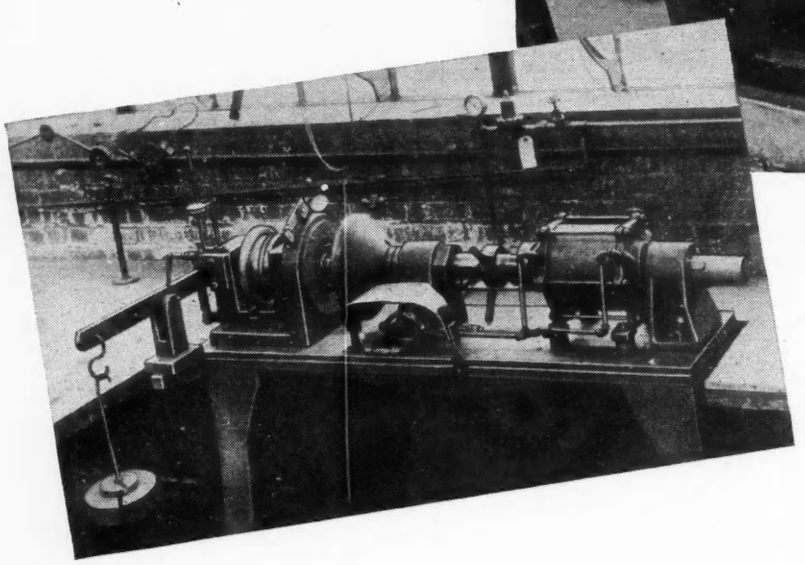


Fig. 1 (Left)—Clutches are checked for vibration damper characteristics as well as runout or drag on this inspection machine

Clutch Production

by Joseph Geschelin
Detroit Technical Editor, Automotive Industries

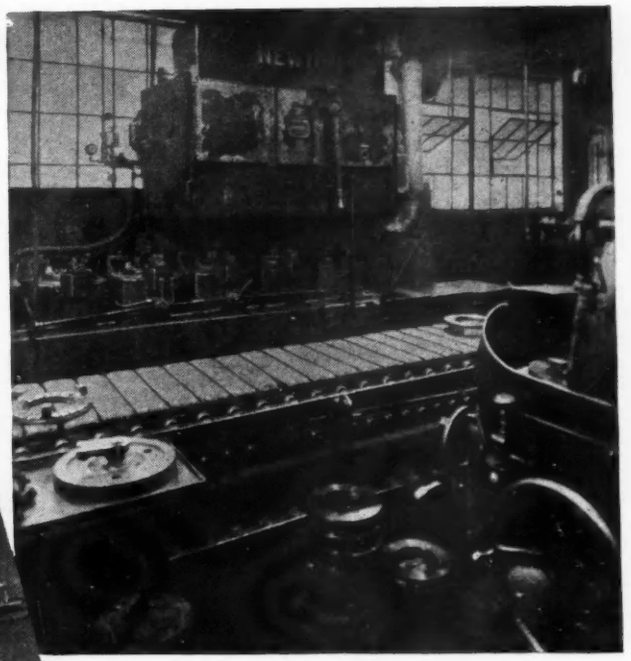


Fig. 4 (Above)—Three-head rotary Newton mill for cutting deep formed slots in pressure plate lugs

Fig. 3 (Left)—Forming release levers automatically on this punch press set-up. Stampings are knocked out by air and swung out of the press by a sweep arm

nected to the driven plate of a standard clutch mounted to the flywheel on the left side of the fixture. In operation this clutch is engaged to the cam mechanism shown on the front and, after the two fly wheels are brought up to motor speed, the clutch on the left is released and the clutch on the right gradually engaged, thus bringing the flywheels to a stop. In other words, the clutch on the left is the driving mechanism, while the one on the right is the braking member. This cycle is repeated for 10,000 engagements and the exact amount of wear on the facing of both clutches recorded.

Experience indicates just how much wear is permissible for a series of 10,000 cycles. More than the established value for wear is sufficient cause for an adverse report.

A very ingenious punch press set-up is shown in Fig. 3. Here is an entirely automatic arrangement for forming release levers at the rate of 1700 per

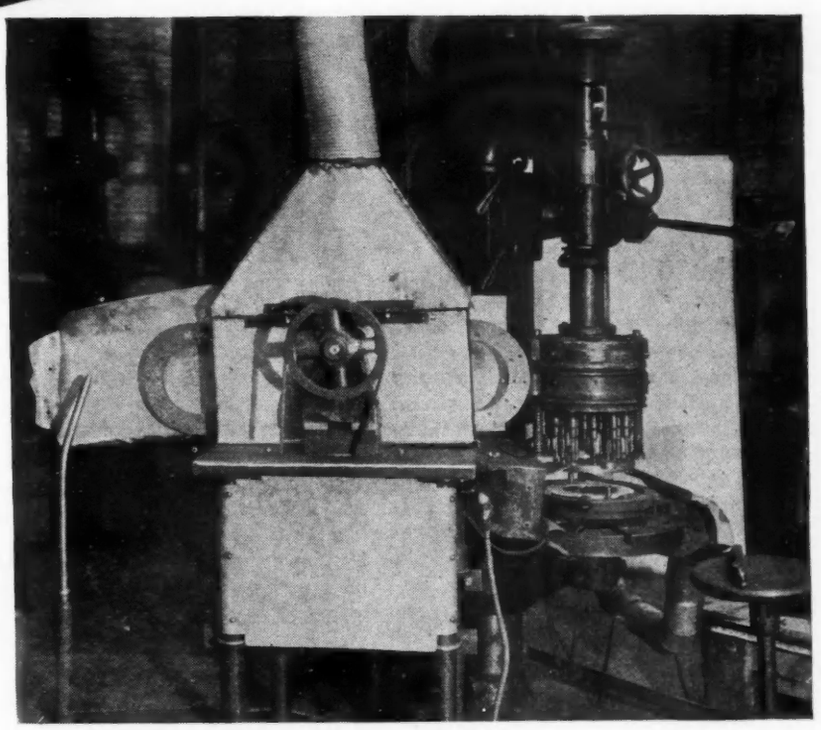


Fig. 5—Combination unit for finishing facings. Drilling and counterboring at the right with tools tipped with cemented-carbide. Grinder at the left removes burrs and assures paralellism of both faces.

hr. As shown, the die is fed by magazine while the finished stamping is ejected by an hydraulic mechanism which releases the piece by a blast of air and simultaneously swings the sweep arm, shown in the die opening, which carries the levers out of the press.

One of the very few special machines used here is the Newton multiple, rotary head milling machine, Fig. 4, for milling formed deep slots in pressure plate lugs. Three heads work simultaneously, each one having a three point indexing fixture. Each head mills three slots in the pressure plate, taking one at a time and indexing three times successively. One of the milled slots may be seen in the station at the extreme left.

While the machine is in operation the operator loads three more plates in the fixtures at the left.

The most recent development in process is the combination unit in Fig. 5 for finishing clutch facings. The drill press at the right drills and counterbores while the unit at the left is a grinding fixture. All the tools used in the drill press set-up are tipped with cemented carbide to increase the life of tooling under the severe conditions of cutting abrasive material.

As the operator removes the facing from the drill fixture he slides it into the grinder where the piece runs through between two wheels. This operation serves the dual purpose of improving the parallelism of the facing, at the same time removing any burrs that may be thrown up in the drilling.

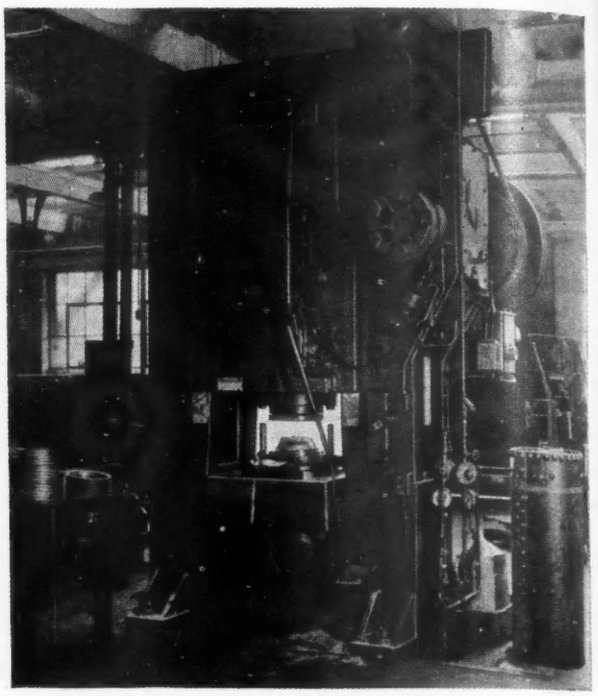


Fig. 6 — Big Cincinnati Rigid-Press used to form the clutch cover. This heavy job is done at the rate of 400 pieces per hour

A master touch is added by the device at the left of the grinder. As the facing rolls out of the grinder it strikes the bent portion of the guide plate, stops, and then falls out onto the inclined rod. Then it slides down and neatly stacks itself in place.

The foregoing are just a few high spots illustrative of a very interesting manufacturing plant that turns out a surprising volume of product for its size. As we mentioned earlier, the outstanding feature here is the emphasis on quality control at every step.

Engineers no doubt will be most interested in the availability of the research facilities afforded by this organization, particularly by the inertia-testing machine which tells immediately whether or not a new facing material has commercial merit according to present day standards.

Rolling-Resistance Coefficients

IN calculating horsepower requirements for different speeds, one of the factors that come up and concerning which there is usually some uncertainty is the coefficient of rolling resistance. This, of course, depends to a considerable extent on the type of road surface, but is dependent to a certain extent also on the nature of the tires. Following are coefficients of rolling resistance for various roads given in a report on "Motor Vehicle Power Requirements on Highway Grades" presented at the recent annual meeting of the Highway Research Board by Professor R. A. Moyer of Iowa State College:

Type of Surface	Rolling Resistance, Lb. per Ton
P. C. concrete	19.0
Asphalt-filled brick	20.0
Minnesota oiled gravel	21.5
Bituminous macadam	23.0
Iowa oiled gravel	24.0
Untreated gravel (dry and firm)	27.0
Loose gravel	50.0
Soft, wet gravel	120.0
Iowa mud	200.0

All determinations were made with a Studebaker 1932 sedan with standard equipment, including the optional free-wheeling unit, and 18/5.50 in. tires which were inflated to 35 lb. per sq. in. The first five values were determined by the coasting method, the last four on the basis of fuel consumption.

6.3% of Ford Eight Weight is Rubber

THE quantity of rubber used in each Ford car has substantially trebled during the past eight years. There is 164 lb. of rubber in each Ford V-eight, whereas the Model T contained only 56 lb. Part of this increase, of course, is due to the increase in weight of the car. Considering the weights of the two models, the proportion of rubber in the V-eight figures out to about 6.3 per cent, while that in the Model T was only 2.8 per cent. In the earlier cars rubber was used chiefly for tires and tubes; today it is being used for steering wheels, batteries, switches, junction blocks, weatherstrips, running boards, floor mats, engine supports, axle bumpers, sound deadeners, fan belts, radiator hose, insulating material, grommets, door bumpers, spring-shackle bushings, and top materials, as well as for tires and tubes.

Publications Received

Taurus Bronze Castings, Second Edition, published by David Brown & Sons (Hudd.) Ltd., Huddersfield, England.

JUST AMONG OURSELVES

Spiked Gasolines in the Headlines

ALCOHOL-GASOLINE blends broke into the headlines again last week in connection with the agriculture-industry conference held in Henry Ford's Greenfield Village at Dearborn. Started as a farm-relief measure, spokesmen for the American Chemical Foundation professed to see in such fuels the possibility of building a great new chemical industry. Moreover, they looked forward to the as yet undetermined day when our petroleum resources will be gone and urged an immediate beginning toward the development of alcohol production to take the place of gasoline when that day came.

Recognizing that with present agricultural output, not nearly enough alcohol could be produced to supply motor fuel in the required quantities, it was proposed that expansion of the production of the necessary agricultural raw materials be started at once and continued until enough alcohol was available to permit a 10 per cent blend.

Alcohol's proponents painted a glowing picture of its advantages as a motor fuel. Nothing was said, however, so far as we know, about the fact that at present corn prices a 10 per cent blend would increase the cost of motor fuel perhaps by more than four cents per gallon, nor of the difficulty of making the alcohol-gasoline mixture stay mixed in the presence of water which it might pick up during distribution.

The petroleum industry does not share the Foundation's optimism regarding the possibilities of spiked gasoline. Nor, in view of the estimate that 10 per cent blends would add about $500,000,000 to the annual motor vehicle fuel bill, does the automotive industry.

Since it is obvious that existing test data indicating that alcohol blends are a less satisfactory fuel at an increased cost, are not accepted as conclusive by the Foundation, further technical and economic research seems to be in order to determine the issues. Consequently, the American Petroleum Institute hit the nail on the head when it proposed just such a project, the work to be financed jointly by the Institute and the Foundation.

* * *

Safe Driving Is Intelligent Driving

INCREASING recognition is being given by the industry to the fact that the appalling annual toll of highway accidents is one of its most serious human and economic problems. And it is encouraging to note that in efforts to make motoring safer there is an increasing tendency to strike at the heart of the situation.

In the past a good deal of automotive effort along this line has been directed at putting and keeping vehicles in safe operating condition. Such effort is laudable, and in some cases perhaps directly profitable through the increased sale of maintenance and maintenance material. But at best statistics indicate that unsafe vehicles are responsible for a very small minority of accidents, and that if real progress is to be made the dominant cause — dumb driving — must be attacked.

In this connection it is interesting to learn that the *Ladies Home Journal* will start a series of articles in June to promote safer and more intelligent driving. A feature of these articles, which were written by Paul de Kruif of "Microbe Hunter" fame, is a safe-driving pledge to which drivers are asked to adhere. This pledge is really a code of fair practices for automobile drivers. If generally adhered to, highway accidents would no longer be a problem.

The job of improving the driving habits of our millions of motorists is a stupendous one, but the toll of accidents is now so great it is imperative that it be undertaken. If something is not done, naive faith in the curative powers of legislation is likely to confront the industry with restrictive laws that will hamper without helping. In the long run education is the only answer. The industry might well get behind a movement to teach people how to drive safely.

* * *

NOW and then we get requests from editors of engineering magazines published by students at various universities for cuts which are used to illustrate technical articles in *Automotive Industries*. We are usually able to make these cuts available for this purpose and whenever possible we are glad to do so.

* * *

"BELIEVE it or not," production during the first four months of this year was at a rate that would make the full-year total 4,350,000, if output follows the normal seasonal trend during the remainder of the year. This figure, we hasten to point out, is the result of a calculation by our staff statistician, and not a prediction.

The Editors

Piston Rings and the Control of Consumption in New and Used E

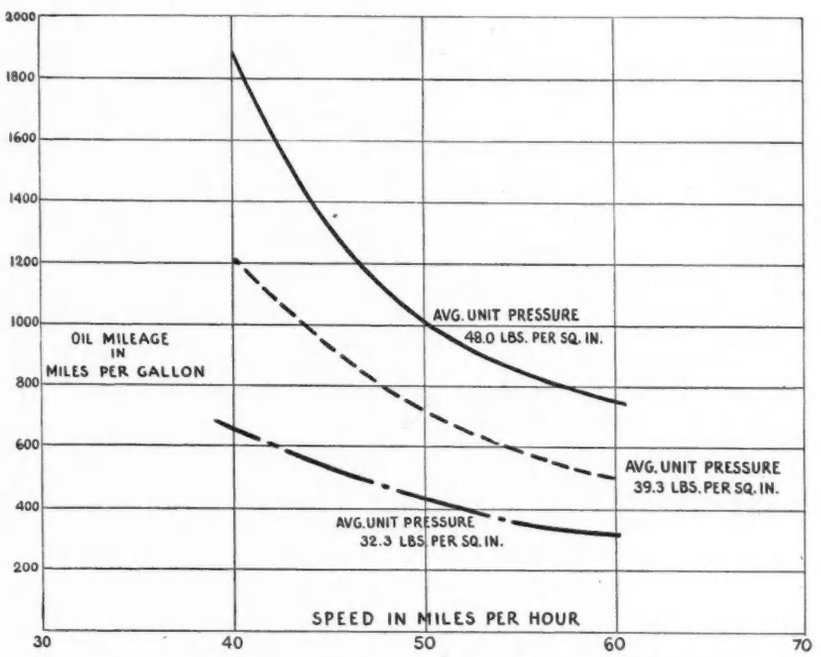


Fig. 1—Effect of piston-ring unit pressure on oil-mileage

NO parts of an engine are the subject of more research or of more difference of opinion than pistons and piston rings. This is understandable in view of the requirements imposed upon them. The task of sealing gases under high pressures in the combustion chamber, with a piston moving up and down a none-too-straight cylinder at a wide range of speeds and temperatures, can only be equaled by the task of returning to the crankcase the large amounts of oil continually being thrown into the cylinders by the crankshaft. Even though the pistons and rings may be performing perfectly, there may be some undetected factor causing high oil consumption or blow-by for which they will be blamed.

Getting satisfactory oil consumption continues to be one of the biggest problems confronting engine builders. Practically all engines are being equipped with oil control rings of the wide-channel type which depend for their effectiveness very largely upon a high unit pressure against the cylinder wall. This permits them to cut through the oil film and prevents the oil getting up past the piston. The curves in Fig. 1 show the effect of different unit pressures on oil consumption. Tests were run consecutively in the same engine under the same conditions with rings of identical design, the only difference being the unit pressure of the oil rings. It would appear from this that the solution of the problem of high oil consumption lies in continuing to increase the unit pressure of the oil rings. There are two definite reasons why this cannot be done at the present time. The first is that unit pressures have already reached a maximum for the strength of the material at present available and, secondly, because of the alarming increase in the rate of wear of the oil ring with an increase in pressure. As the rings wear, they open up against the cylinder and lose tension. This loss in tension causes a drop in unit pressure, with the effect on oil consumption indicated by the curves. The extent to which we have already gone in this direction is indicated by the rapid increase in the use of oil in most cars after a comparatively short mileage.

From the cross section of a wide-channel type oil-control ring in Fig. 2 it is easy to see these points. Because of the need to keep the total pressure of the ring as high as possible, the channel must be kept comparatively shallow, and this limits its ability to store oil collected from the wall during the collecting part of the stroke. It therefore becomes essential that the leading scraping edge do the brunt of the work, which is only possible when it is very narrow and when there is high pressure concentrated upon it. The effect of these narrow scraping edges is to increase the rate of wear out of proportion to the increase in pressure, because of the knife-edge action of such a narrow surface.

A distinct improvement has been made in wide-channel rings by undercutting the groove, as shown in Fig. 3. By making the channel in this shape it is possible to get more area for the storage of a larger amount of oil during the collecting part of the stroke

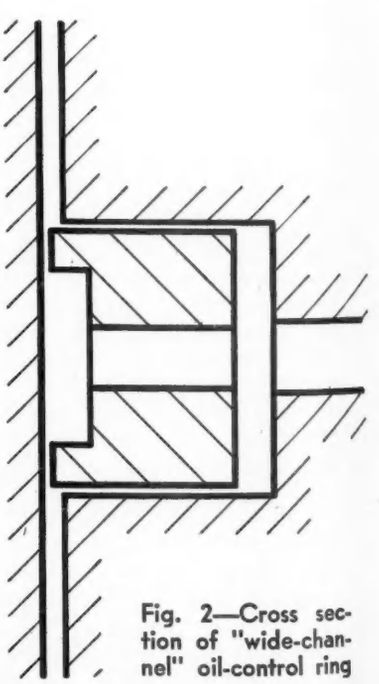


Fig. 2—Cross section of "wide-channel" oil-control ring

# of Oil Engines*

by D. D. Robertson
Chief Engineer, Wilkening Manufacturing Company

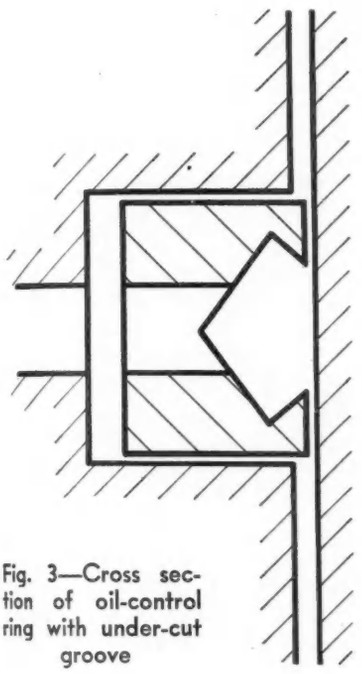


Fig. 3—Cross section of oil-control ring with under-cut groove

Table I **Piston Ring Wear** See Page 673

	CASE I	CASE II	CASE III	CASE IV
Mileage	8750	8300	1900	137,912
Test Run	Dynamometer	Dynamometer	Dynamometer	Road
Wear from Thickness				
1st Ring—Comp.	.0015	.001*	.002/.0025	.034/.047
2nd Ring—Comp.	.001	.0007*	.0015/.002	.013/.018
3rd Ring—Comp.	.001*	.0007*	.....	.015/.020*
4th Ring—Oil	.0015*	.001*	.0035/.004	.005/.015*
Wear from Width				
1st Ring—Comp.	.0005 max.	.0005 max.*	.001/.0015	.012 max.
2nd Ring—Comp.	.0005 max.	.0002 max.*	.0005/.001	.006 max.
3rd Ring—Comp.	.0005 max.*	.0002 max.*	.....	.002 max.*
4th Ring—Oil	.0005 max.*	.0005 max.*	.0003/.0005	.0015 max.*
Wear from Ring Grooves	.0002 max.	.0003 max.	None	.....
Wear from Pistons	.0005 max.	.0005 max.	.0005/.001	.....
Wear from Cylinders	.001 max.	.0015 max.	.0005/.001	.....

* Expander Rings.

In addition to the reduction in the rate of wear made possible by the use of lower unit pressure and the wider lands, there is the additional advantage in the undercut design that as the face of the ring wears the lands while taking a minimum of the total pressure from the ring. This larger cross section of the channel, together with the V-shaped scraping edges which tend to lead the oil away from the wall and into the body of the channel, increases the effectiveness of the ring considerably as compared with a straight-groove ring of the same unit pressure. This permits making wider lands on the sides of the channel, getting away from the knife-edge action, and greatly reducing the rate of wear.

The increased effectiveness of this undercut groove as compared with the straight-grooved ring of the same unit pressure is indicated by the curves in Fig. 4, showing comparative oil consumptions in the same engine under the same conditions. Obviously it is possible to get the same consumption with an appreciably less unit pressure in the undercut-groove rings, as indicated in Fig. 5, in which identical results were obtained with oil rings of the unit pressures indicated.

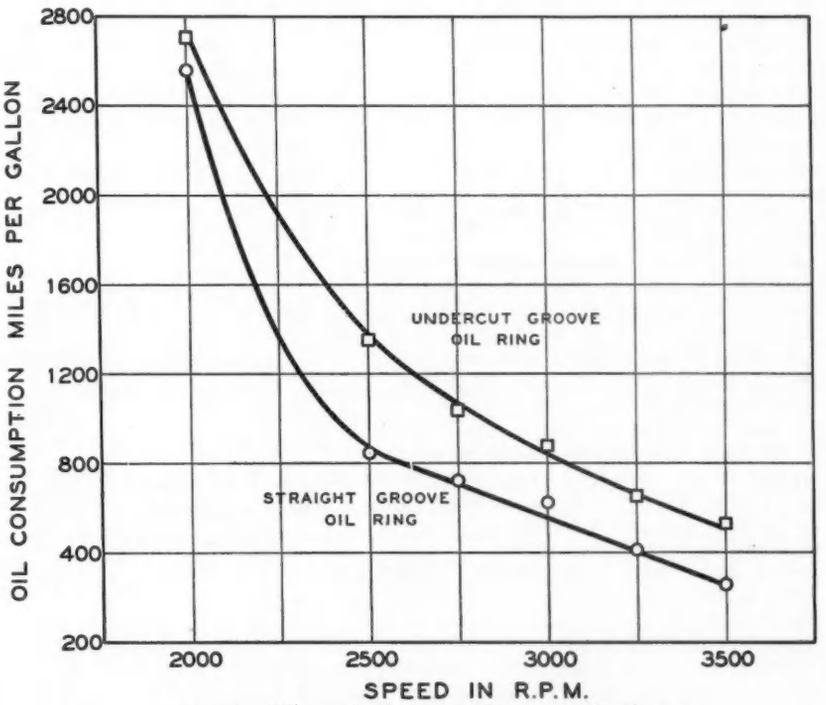


Fig. 4—Effect of oil-groove form on oil-mileage

* Paper read before the Philadelphia Section of the Society of Automotive Engineers, slightly condensed.

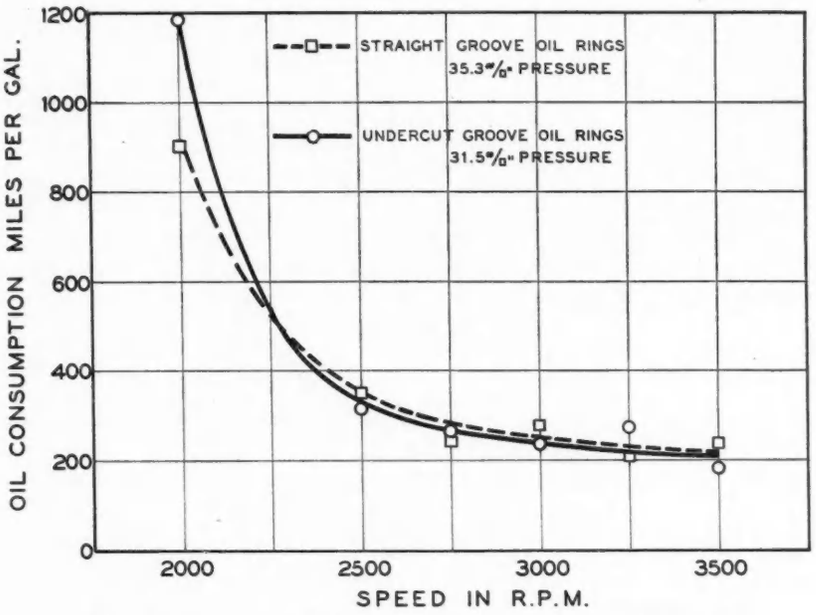


Fig. 5—For equal oil mileage the undercut-groove ring will exert less unit pressure

become narrower. Thus the area in contact with the cylinders is reduced at the same time the pressure is decreased by the opening up of the ring to take up the wear. This effect is indicated in Fig. 6, in which the unit pressure is plotted against the wear from the face of the ring. Starting with the same initial pressure of 42 lb. per sq. in., the unit pressure of the straight-groove ring would drop off to 25 lb. per sq. in. after 0.015-in. wear from the face of the ring, whereas the unit pressure of the undercut ring would be 32 lb. per sq. in. In addition to the slower rate of wear, the effect of the wear is considerably diminished, so far as oil consumption is concerned, as this is so dependent upon the unit pressure.

Another marked tendency in oil-control rings is the increased use of drilled holes rather than slots as a means of providing drainage through the rings. Even with the greatest care it is impossible entirely to eliminate distortion both circumferentially and axially in milling slots of sufficient width to provide adequate drainage. The drilling of a series of holes can be accomplished without this distortion and therefore without this damage to the accuracy of the rings.

This, however, is not the principal advantage of the drilled holes as compared with the slots. The principal advantage lies in the lesser tendency to become clogged with carbon, and it is this fact that has caused a very rapid adoption of the drilled holes during the past two or three years. Reports from one of the largest engine manufacturers, who has used both types for the last three years, indicate that the average mileage before clogging of slotted rings is 20,000 miles, as against 30,000 miles for the drilled holes. As clogging of oil rings is one of the principal reasons for the rapid increase in oil consumption, this is a substantial advantage.

In considering ways and means of controlling oil with piston rings, one factor must always be kept in mind, and that is blow-by. For the most part, oil consumption and blow-by go hand in hand. Improvement in oil consumption almost always is accompanied by a proportionate increase in blow-by and vice versa. By the simple expedient of overlooking the blow-by it is possible to get most remarkable results in controlling oil. This is the fact that the vast majority of the thousands of piston ring inventors seems to overlook. The curves in Fig. 7 indicate what may be accomplished by the very popular blow-by method of controlling oil. The lower curves for oil consumption and blow-by were obtained with rings (No. 1) of conventional design. The upper curves were obtained with the same oil rings by substituting compression rings of a special design which had wonderful possibilities on paper. The improvement in consumption seems almost too good to be true—until we look at the blow-by curves and see that we have increased the blow-by in almost the same proportion that we have improved the oil control and in so doing created a condition of real danger of considerable damage to the engine, in addition to pouring forth large quantities of obnoxious fumes.

These tests also indicate the considerable effect on oil consumption of the compression rings and the fact that the oil-control rings themselves are not the sole factor in the ability of the piston-ring assembly to control oil. They also indicate most clearly that no real contribution to piston-ring design can be made unless it improves oil control without increasing the blow-by, or reduces the blow-by without increasing the oil consumption.

While oil control continues to be a major problem with engine builders, it is even more of a problem with the many thousands attempting to correct oil pumping in cars already turned loose on the general public. The worn cylinders, the increased piston clearance, and the worn ring grooves of these engines present far more of a problem than do the new engines. True, it is possible to remachine the cylinders and install new pistons and restore the original conditions, but this is an expensive operation and one which frequently cannot be justified by the conditions of wear. However slight this wear may be, merely replacing the piston rings will not in the majority of cases prove satisfactory. For many years a wide variety of piston ring designs has been sold to accommodate these worn cylinders and pistons, the designs usually including the use of a sinuous steel expander behind the cast-iron rings. The merit of some of these designs has been definitely established and in spite of the great resistance they have had to overcome, they are

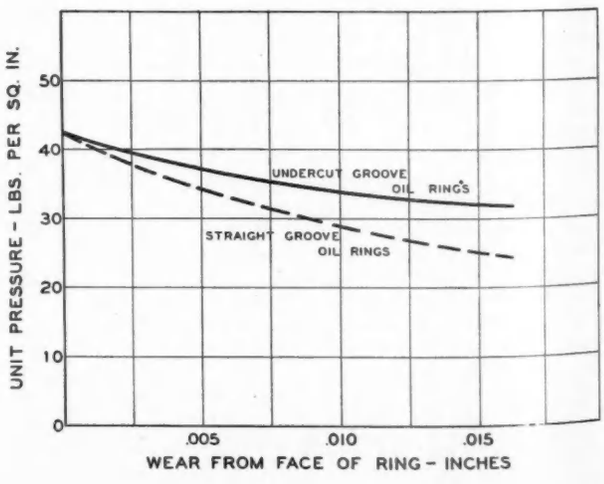


Fig. 6 — Variation of ring wear with unit pressure

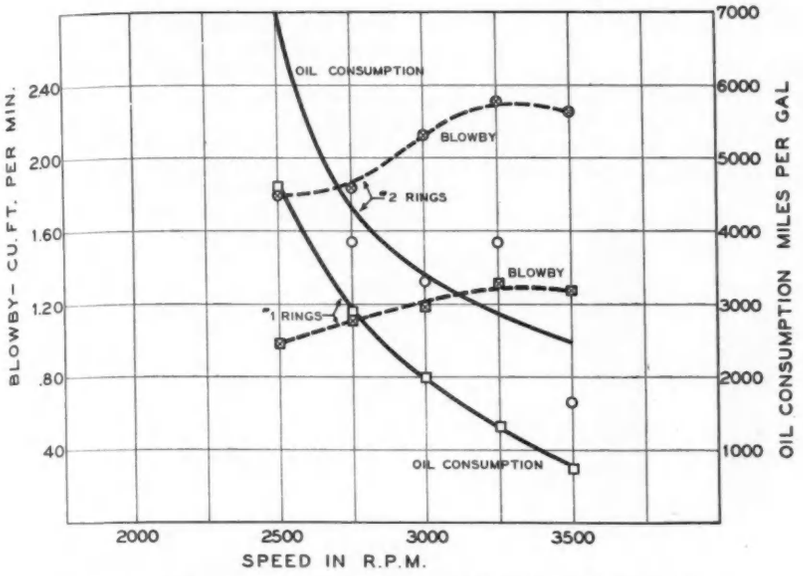


Fig. 7—Variation of oil mileage and blow-by with speed for two types of rings

coming more and more into use in the service field. In passenger-car engines reboring is resorted to only when cylinders are scored or otherwise damaged, while in commercial engines at least one or two sets of these rings precede a complete overhaul.

In addition to the fact that it is a much cheaper method, the use of special oil-control rings is frequently even more effective than boring the cylinders and installing new pistons equipped with rings of the original design. Two of the reasons for this are the difficulty in securing correct alignment of the newly bored cylinders with the crankshaft and the greater distortion of the cylinders from the thinner walls.

This is exemplified by Fig. 8, which is based on tests in an engine with only a nominal amount of wear. Two different makes and types of wide-channel oil-control rings gave approximately the same results, as indicated. The oil consumption was cut just about in half by the use of special expander-type oil-control rings, this particular type consisting of two cast-iron sections of the hydraulic design. The cylinders were then bored and honed, and new pistons installed, equipped with wide-channel oil rings. While the oil consumption was less than with the wide-channel oil rings before the boring and honing, it was still considerably greater than with the special oil rings. While this is by no means always true, especially as conditions of wear become more severe, it indicates very definitely the place of expander-type rings in the piston-ring picture.

One of the greatest objections to the use of expander-type rings has been the possibility of a considerable increase in friction as a result of the greater pressure of the piston rings against the cylinders, with the possibility of increased fuel consumption, increased wear, and overheating. It is true that many expanders will give a very undesirable increase in friction and many designs have caused excessive wear and even serious damage. For this reason expanders and expander-type rings should never be used indiscriminately. However, when the expanders are properly designed, the increase in friction is not sufficient to be of importance, especially in view of the considerable improvement in oil consumption that can be obtained. In Fig. 9 the friction horsepowers of these same rings are compared with those of the new engine. For each of the four speeds at which the readings have been plotted, the column on the left indicates the friction horsepower of the new engine after breaking-in, the second column, the friction obtained through the installation of new rings of the original design, there being about 10,000 miles on the engine at the time, the third column indicates the friction after the reboring, the increase being due to the reduced piston clearance, while the fourth column shows results with the special expander-type rings.

From these figures it is apparent that, except at very low speeds, the friction is less with the expander rings than that in the new engine and almost the same as in the rebored job. In no case is it of sufficient amount to cause any appreciable increase in fuel consumption or to cause any danger of overheating or increased wear. The maximum difference between the friction in these four installations is 3 hp., and for the most part not more than 1 hp. All of these friction readings were taken immediately after full load runs while the engine was still at operating temperatures.

Some figures on piston-ring wear are compiled in Table I. These are from four different installations, three of which were subjected to dynamometer tests while the fourth was placed in road service. In the first case the installation consisted of two compression

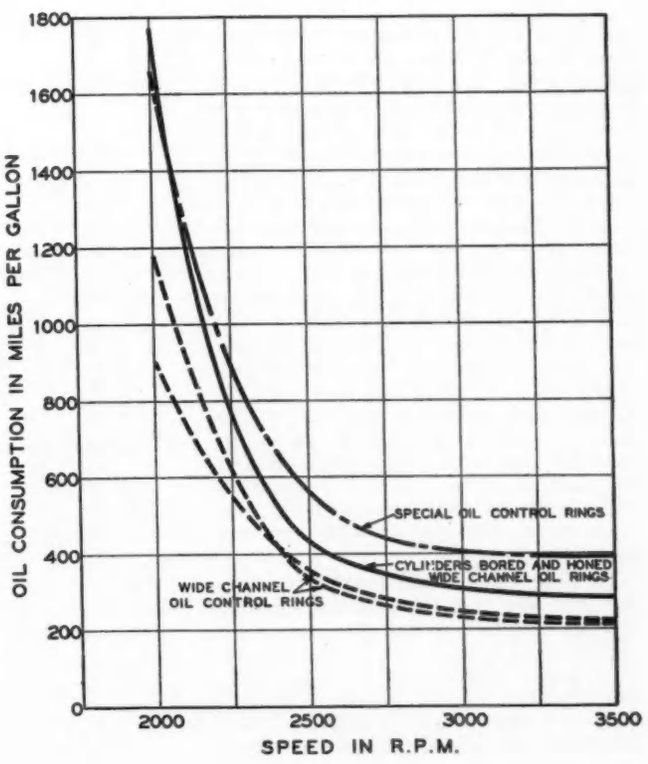


Fig. 8—Effects of different ring equipments on oil mileage

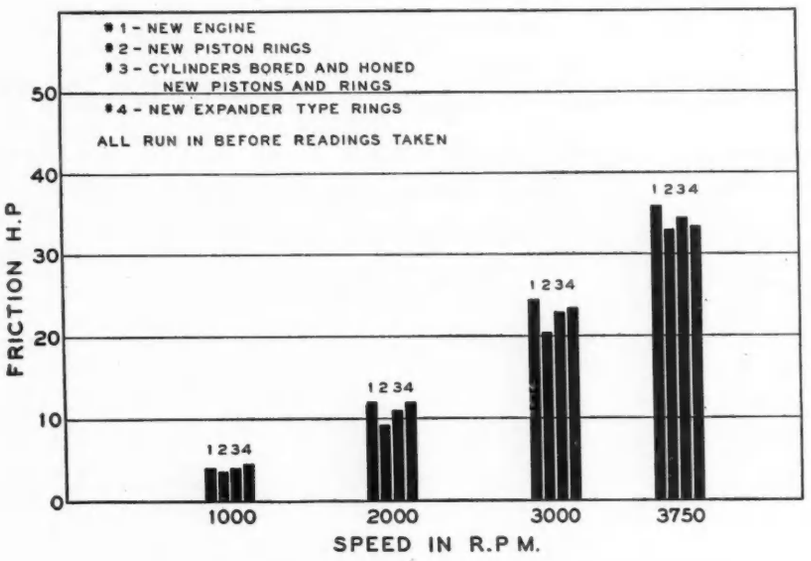


Fig. 9—Effects of different piston and ring equipments on friction horse power

rings without expanders and one compression ring and one oil ring with expanders. The mileage was 8750. The average wear from the face and from the sides of the rings is given. Wear on the face and sides of all of the rings was extremely small and the expander rings did not wear more than the rings without expanders. The wear is normally greatest at the top ring and decreases in succeeding rings down the piston. This is not true in the case of the oil ring, because of its higher unit pressure. In this case, with an expander-type oil ring the wear was no greater than that of the top compression ring, and on all the rings it was barely more than enough to remove the tool marks. Wear from the ring grooves was extremely small, the pistons showed almost no wear, and the maximum wear of the cylinders was 0.001 in. In this case the expander-type compression and oil-control rings were of the two-piece cast-iron hydraulic type. In the second case, which was run under similar conditions but in another engine, the test was run for 8300 miles, all four of the rings being of a single-piece expander type, the oil-control ring being of a slotted design. The wear of the rings was slightly less than in Case I and the wear of the pistons and cylinders practically the same. These results would seem to indicate that with good, clean oil and the absence of any abrasive material, differences in total pressures of the rings have little or no effect on the wear.

In Case III, in still another engine, the test was run for only 1900 miles. During this test, which was run with conventional type piston rings without expanders, cement dust from concrete being poured nearby got into the engine in spite of the air filter. The effect of this abrasive material is at once apparent, as the wear of these rings is approximately twice as great as in Cases I and II with only one-fourth the mileage. The greater wear of the oil rings shows the effect of the high unit pressure of the wide-channel type when there is abrasive matter present.

From these three cases it appears that the wear of pistons, rings, and cylinders is almost entirely due to factors which, though usually present, are outside influences. These include abrasive material entering with the intake air, crankcase sludge, excessive choking, cold starting and blow-by. Wear inside the cylinders cannot be eliminated without improved air filters and oil filters and improved cold-starting conditions.

In Case IV wear figures are given for a run covering a total mileage of 137,912. The wear from the top compression rings was 0.034 to 0.047 in., and these rings were rendered entirely ineffective. The wear from the second compression rings was also considerable but they were still functioning. The third compression ring and the oil ring, both of the expander type, do not show any appreciably higher rate of wear as a result of increased pressure from the expander. Incidentally, the cylinder liners in this case were especially hard, running about 500 Brinell.

A number of factors other than piston rings are of considerable importance in their effect on oil consumption. In road tests on a new truck engine, experiments were conducted to determine the effect of different locations of the bleed hole in the top half of the connecting-rod bearing. With the bleed hole on the follow side of the rod, an oil consumption of 150 to 200 miles per quart was obtained. By changing the hole over to the leading side of the rod, the consumption was decreased to 500 to 600 miles per quart, this decrease being due to the lesser amount of oil thrown into the cylinders with the bleed hole on the leading side.

High oil consumption often is caused by leakage into the combustion chamber around the intake valve stems. Oil drawn through the valve guides by the intake vacuum gives every indication of oil pumping past the pistons. The effect of this leakage in one particular case is shown in Fig. 10 in which the

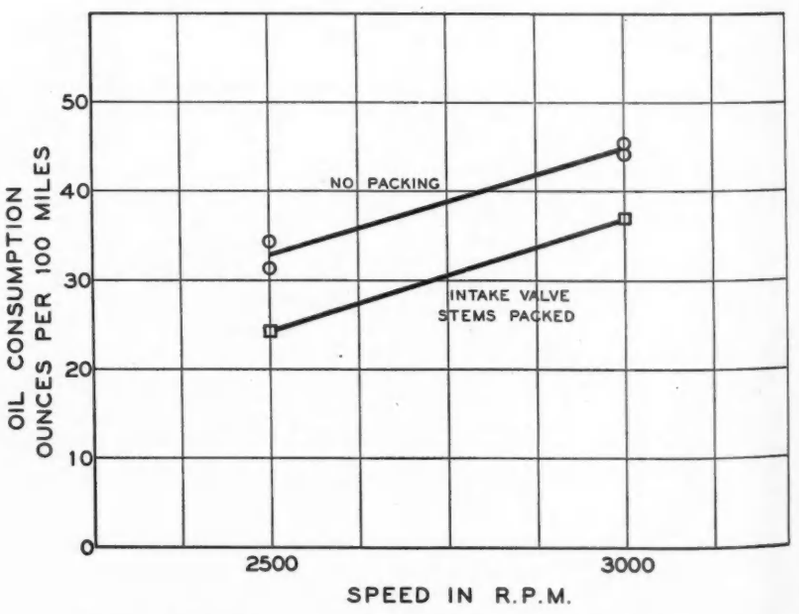


Fig. 10—Effect of leakage through inlet-valve guides on oil consumption

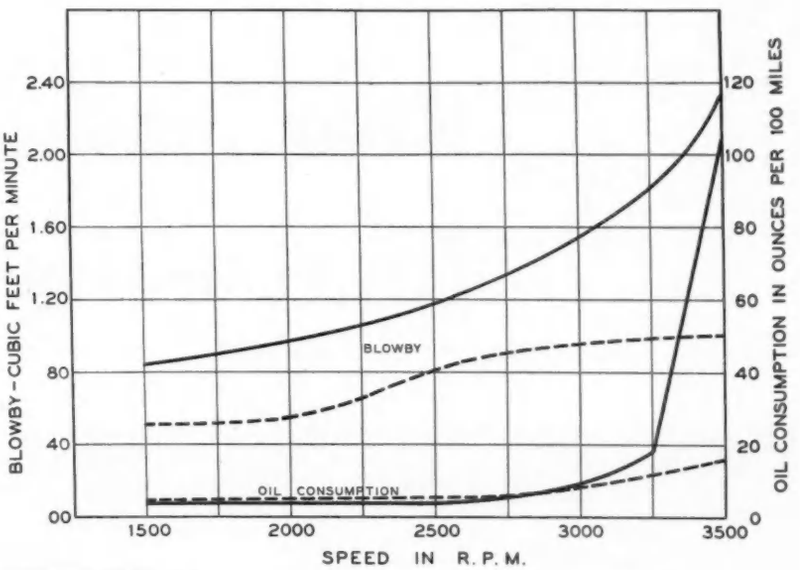
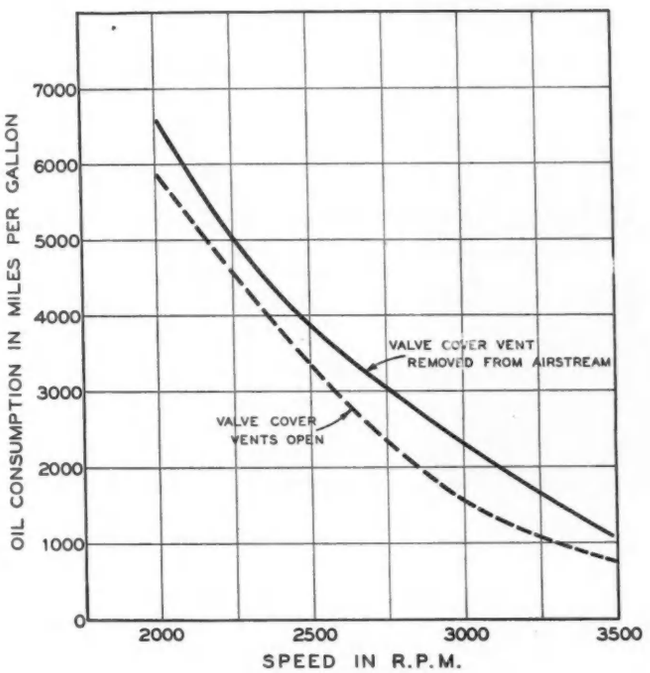


Fig. 12—Relation of oil consumption and blow-by to speed

Fig. 11—Oil loss through valve-cover vents



consumption is plotted at two speeds at which readings were taken. At 2500 r.p.m. 32 and 35 oz. per 100 miles were consumed. With the valve stems packed to prevent leakage, this was cut to 24 oz. per 100 miles, an improvement of almost 30 per cent. At 3000 r.p.m. the consumption was reduced by approximately the same amount.

In one engine with overhead valves the valve cover was provided with louvres on top, facing the back of the engine. The passage of air from the fan across the top of the engine drew fumes from the valve cover which were found to contain a considerable amount of oil spray. To check up on the actual amount of oil being lost in this manner the louvres were soldered shut and a vent provided in the form of a pipe extending about two feet above the engine, entirely out of the air stream from the fan. The improvement in consumption is indicated in Fig. 11.

Increase in blow-by does not always improve the oil consumption, as indicated in Fig. 12. In this particular case the blow-by with one set of rings was so great that at 3500 r.p.m. a great deal of oil was forced out through the rear main bearing. The extent of this leakage can be seen in the jump from 18 oz. per 100 miles at 3250 to 104 oz. at 3500. That speed alone was not the cause of the leakage through the rear main bearing was determined by changing the rings and reducing the blow-by, with the results indicated.

Industrial Accidents Prevented by English Code of Colors

A STANDARD code of nine colors to prevent accidents in the use of machine tools has been devised in England and proposed for international adoption. The idea is, for example, that all hand levers controlling the power supply shall be painted gray and marked with the symbol of an elephant feeding. Stop and start levers are to be painted red and marked with a symbol like the arms of a railway signal.

Levers that change the feed of raw material into the machine are to be painted a mottled green; those which change the speed, a mottled orange. The locking lever is to be painted brown and carry the symbol of a padlock. The reversing lever will be blue and carry an arrow showing the direction of reversal.

All levers controlling screw-cutting operations are to be painted mauve and will bear the symbol of a screw thread. Levers which control the shift of the machine by hand will be black, with a painted hand as symbol. Quick action levers intended to make similar shifts electrically or mechanically are to be painted cream color and will carry the image of a flying bird to indicate speed.

Rear and Under-Chassis M
Increasingly Popular in A

by P. M. Heldt

Engineering Editor,
Automotive Industries

Low step and floor height facilitate entrance in Madison Ave., New York coaches

ONE of the latest large installations of buses in city service is on Madison Avenue, New York, where an old trolley service has been replaced. The traffic is exceedingly heavy, especially at the lower end of the line. Speed is restricted, but stops are very frequent, and acceleration and deceleration therefore are of great importance. The buses in use are of Yellow Coach manufacture. They have a wheelbase of 213 in. and a seating capacity of 41, including the driver. The overall length of the bus is 33 ft. and the overall width, 96 in.

The powerplant consists of the Yellow Coach Co.'s Type 616 engine with six cylinders of 4⅞-in. bore by 5½-in. stroke, which delivers 151 hp. at 2300 r.p.m. With a rear-axle ratio of 6.55 to 1 and 9.75/24-in. tires (42-in. effective diameter) the bus speed at nominal engine speed figures out to 44 m.p.h. As the coach weighs approximately 17,000 lb. with equipment and supplies ready for service, the displacement factor is 20.5 cu. in. per ton-foot for the empty vehicle and 15.1 cu. in. for the vehicle with a full load of passengers. These figures are relatively high for bus service.

The engine with its clutch and transmission is mounted transversely at the rear of the bus, largely under the rear transverse seat. Back of this seat there is a ledge or shelf 9 in. wide, which is necessary to assure that passengers' heads will clear the curved rear panel. The powerplant is mounted on rubber at three points, two on opposite sides

Interior of Madison Avenue coach

Mounted Engines Motor Bus Field

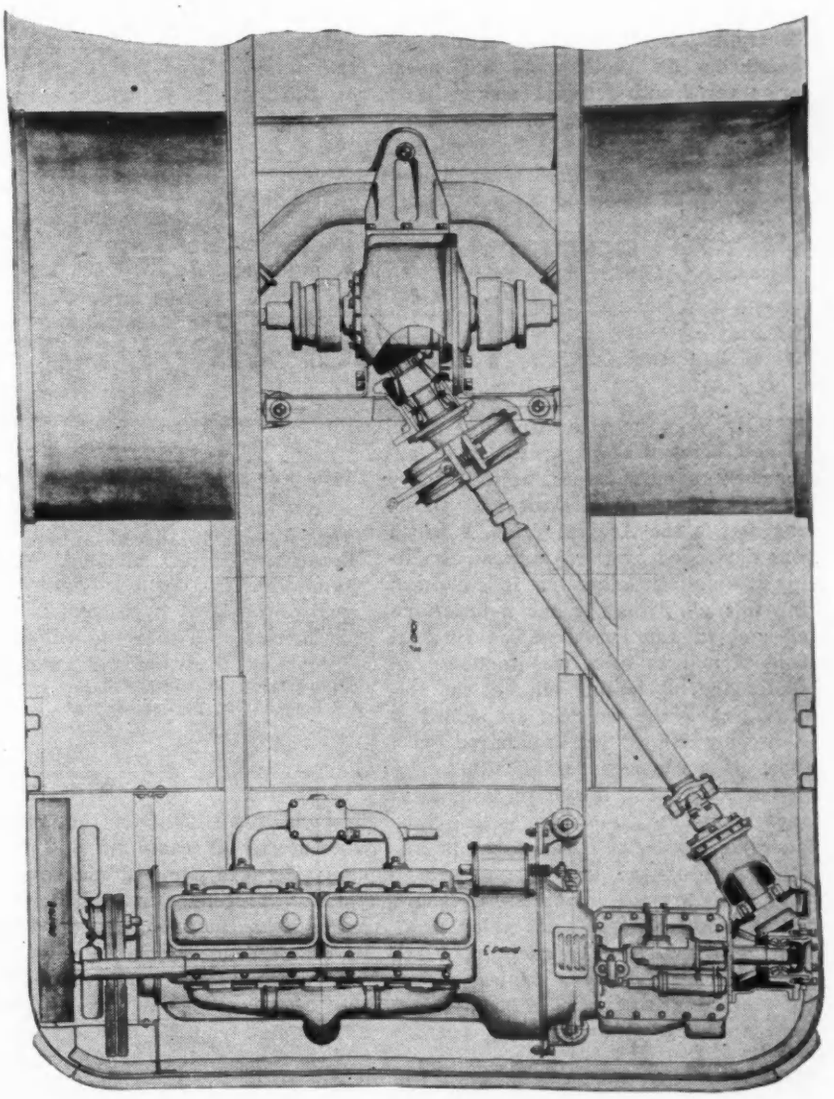
Part Two
The New Yellow Bus

of the clutch housing, the third under the camshaft driving-gear housing. Access to the engine is through four doors in the rear of the bus and through the rear seat, which can be raised on hinges.

A pneumatically-controlled clutch is employed. The specially-designed synchromesh transmission is also pneumatically controlled, so that the need for long mechanical connections to the clutch and transmission is obviated. All forward speeds are synchromesh, and low and intermediate speeds have constant-mesh helical gears. The low ratio is 3.32 to 1; the intermediate, 1.72 to 1.

By using an angularly arranged propeller shaft, the direct-drive feature in the transmission is retained. The final drive unit is rubber-mounted, as is the powerplant, and universal joints are used at both ends of the propeller shaft. The propeller shaft receives its power through one pair of spiral bevel gears and transmits it to the differential through another pair of the same kind. Part of the reduction is effected through the gears at the transmission end. Mounting the final drive gear and differential on frame members reduces the unsprung weight. The rear axle, which is of the De Dion type, has a dead axle of tubular form.

There is no separate chassis, the powerplant being supported by an



Rear-mounted powerplant and angular drive of Madison Ave. buses

Yellow-Coach 41-passenger city bus in service on Madison Ave., New York

understructure which is in unit with the body. All-metal construction is employed, the structural members being of aluminum. The belt rail is a continuous section of extruded aluminum alloy, while body posts are of forged duralumin.

Loading and unloading are facilitated by a low floor height and by the provision of two doors. All passengers enter at the front, where fares are collected by the driver, and passengers may leave through either the front or center door. Both doors are of the well-known jack-knife type and are air-controlled. Seats have comfortable upholstering and both seats and backs are covered with genuine leather. After taking a ride on one of these buses and on one of the trolley cars on Lexington Avenue, a block away, one is no longer surprised that the replacement of trolley cars by buses on Madison Avenue should have increased the traffic materially. There cannot be much difference between the speeds of the two types of conveyance, because that is largely determined by the flow of traffic, but there is no comparison between the degrees of comfort of the old noisy trolley cars with their steel wheels and hard, wooden seats and of the new buses with their pneumatic tires and deeply upholstered seats.

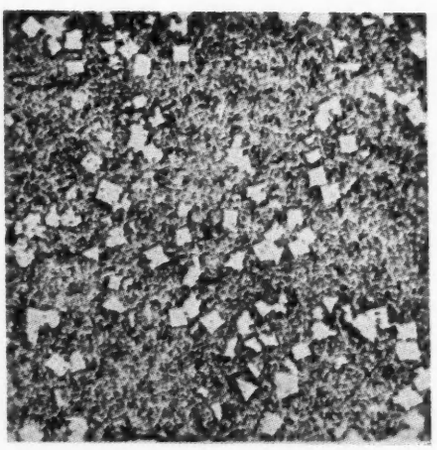
Location of the powerplant at the rear tends to keep fumes and heat out of the bus body, and an improved ventilating system is provided in addition. Air enters through air ducts extending the length of the body at the top on both sides, which communicate with the interior of the body through 16 louvers each. Air from the interior of the body passes out through louvers into an ejection chamber under the front roof crown, from which it escapes through suction louvers extending through the roof. In the buses as originally placed in service, air circulation was produced solely by the motion of the vehicle, and was under full control of the driver at all times by means of adjustable shutters in the entrance and ejection louvers. I understand that a power-ventilating system is being installed at present.

Asarcoloy No. 7—A Cadmium Nickel Bearing Alloy

THE cadmium-base bearing metal now being used by a number of automobile manufacturers, as well as by manufacturers of aircraft and Diesel engines, is the Asarcoloy No. 7 which was developed by the American Smelting & Refining Company. It is claimed for this alloy that it has a lower coefficient of friction than conventional babbitt and to have less tendency to sludge the lubricating oil. In the following table the physical properties of Asarcoloy No. 7 are compared with those of a conventional babbitt.

	Deg. F	Asarcoloy No. 7	Babbitt
Brinell Hardness at	82	33	24
" " "	212	22	12
" " "	390	7	4
Yield Point in Tension lb./sq. in	...	11,700	8,500
Elongation at	82	19	10
" "	212	36	24
" "	390	111	86
Reduction of Area at	82	43	12
" " "	212	52	38
" " "	390	76	76
Compression Strength (10 per cent reduction in gage length) lb. per sq. in. at	82	21,800	14,000
"	212	14,300	8,300
"	390	4,400	2,300

Asarcoloy No. 7 is similar in appearance to babbitt, and there is also considerable similarity between the microstructures of the two alloys, except that cubes are the only phase found in the matrix of a normal Asarcoloy No. 7 bearing structure. The micrograph reproduced here shows a typical structure of Asarcoloy No. 7 containing approximately 1.30 per cent nickel.



The cubes are $NiCd_7$; the matrix is the eutectic of cadmium and $NiCd_7$, analyzing 0.25 per cent nickel.

Like the conventional babbitt, cadmium-nickel may be varied somewhat in composition to obtain alloys with different physical properties. Properties suitable for bearings lie between approximately 0.75 and 3 per cent nickel. As the nickel content increases, the strength and hardness increase and the ductility decreases.

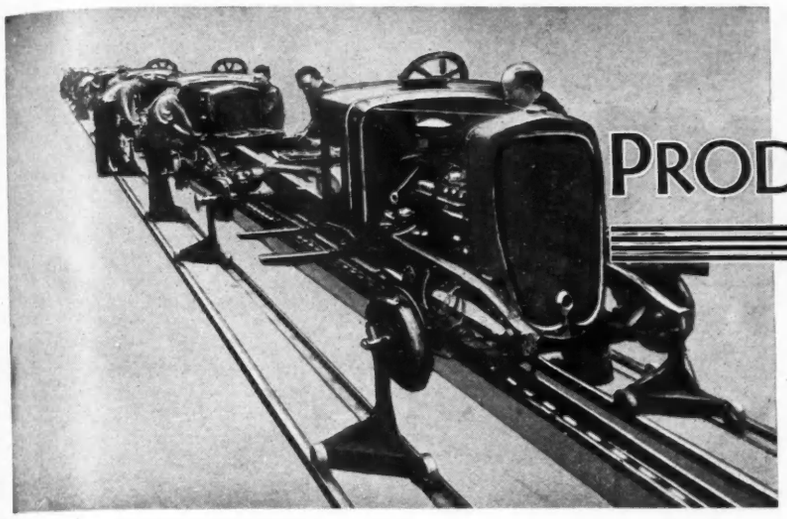
Unlike most cadmium alloys, cadmium-nickel bonds directly with steel so that the same composition in use for the bearing proper may be used for bonding. The bond differs from other bonds in that no chemical compound is formed at the bond, but nickel penetrates the steel slightly, much the same as in welding of nickel to steel. This bond is claimed to have much greater ductility than those bonds in which a chemical compound is formed.

Among the more important advantages of the cadmium-nickel bearing alloys over the conventional babbitts are the greater fatigue resistance, greater toughness, lower coefficient of friction, greater strength, more ductile bond (the alloy being self-bonding) and higher melting point.

Fifteen States Enact Safety Glass Measures

The wave of safety glass legislation which appeared before state legislatures during the past year has culminated in the enactment of such laws in 15 states, according to an AMA bulletin. The states include Indiana, Iowa, Massachusetts, Michigan, Missouri, Nebraska, New Jersey, New York, North Dakota, Ohio, Pennsylvania, Vermont, Virginia, West Virginia and Maryland.

In most cases the general tenor of these Acts make mandatory the equipment of motor vehicles manufactured or assembled after July 1 of this year with shatter-proof glass at all points where glass is used. The laws of Indiana, Missouri and Vermont differ from the other commonwealths in that the date of the measures' effectiveness is January 1, 1936.



PRODUCTION LINES

Skilled Men

Contrary to the popular notion, the population of skilled workers in automotive plants is steadily on the increase. According to an estimate by one of the DeSoto factory executives the number of highly skilled men has increased at least 25 per cent since 1925. Technical training schools operated by many of the leading manufacturers help to swell the total.

Multiple Out

Some years ago it was possible to start an argument as to the relative merits of single story and multiple story factory buildings. Today no one would consider anything but a single-story production plant, given the right conditions otherwise. There are experts today, like the Austin Co. engineers, who make an intimate study of plant design. To them the building is not just something to keep out the rain. It's an integral part of the production process—designed to facilitate economical manufacturing and handling.

Official Specs

Union Drawn Steel does its bit for you by providing a cardboard stock folder giving the physical properties of the new series SAE steels. These data are supplemented by some notes on special free-cutting steels made by this company. No trouble for us to get you a copy.

Rollergravure

Hyatt joins the parade of house organeers with the Hyatt Rollergravure with which you should get acquainted. It's a rotogravure of almost newspaper size. It shows good action photographs of mechanical equipment that uses bearings and in the same breath gives the details of the bearing installation. Drawings, photographs and sketches tell the story rather completely. Are you listening?

Note Book

Just received a handsome brass-bound, brass spiral note book on Brasses. It comes from the Copper Development Assn. of London. Forty-five pages of real up-to-date data on the metallurgy of brasses, special compositions, fabrication, extruded shapes, etc. Are you interested?

Real Tribute

Generous tribute was paid the parts-making industry by an important executive recently. In his report to a group of car distributors, this executive said that the progressiveness of the organization was due to the cooperation and research facilities of a group of outstanding parts makers.

Czech News

From Czechoslovakia comes news that Tatra has recently built an aluminum bus for the town of Prague. This firm has also built a railway car completely insulated with Alfol—the aluminum sheet we mentioned some moons back.

Elastic Nut

We hear that the Elastic Stop Nut, the one with the fiber locking collar, has been supplied in aluminum for the aircraft industries.

Welding Upped

Bright future in the offing for welding technique. Welding is more than ever a fundamental process in automotive production and many new applications are going through. We talked just the other day with a man who is probably best informed in this field. He has developed a new portable welder for spot welding on the line. It's light, small in size, and has wide range of application without much change in tooling. This unit will be described exclusively in these columns.

Time Calculator

Barber-Colman has been distributing a special slide rule for determining the time per piece on any hobbing job. It's free to our friends, for the asking. If you can use one ask us for the Production Time Calculator.

Control Speed

It seems that Turkey is putting on a big safety drive culminating in legislation making engine governors compulsory. Looks like a bright spot for our own governor builders if they get on the job right away.

Alloys of Iron

Those who are interested in progress in fundamental research in the field of alloys of iron and other projects of the engineering societies will want a copy of the current report of the Engineering Foundation. The 1934 Annual report now off the press.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

May Nears 400,000

(*Continued from page* 653)

tail market and available figures on deliveries for May show irregularity at levels slightly below the peaks reached in April. Orders on hand will maintain deliveries at close to the current rate throughout May but unless new orders again pick up, June will bring smaller figures in both deliveries and production. Opinion is by no means unanimous on the possibilities of the retail market in June—some sales executives are still looking for bigger volume next month.

April Registrations

New passenger registrations returns for April from 18 states amounted to 75,420 as against 51,129 for the same states during April, 1934, an increase of approximately 47 per cent. If the same ratio as prevailed for these 18 states is maintained throughout the remainder of the country total new car registrations for April will amount to about 328,000 as compared with 222,900 in April of 1934.

Chevrolet

With a big bank of unfilled orders accumulated during the two weeks enforced idleness of a majority of its assembly branches, Chevrolet will speed up quickly to reach normal operations by the close of the coming week and will be in full tilt the final week of May. The strike is said to have lopped some 60,000 units from Chevrolet's May production. Operations were resumed in the company's Toledo plant on Wednesday and in the third hour after starting, it turned out 330 transmissions or the equivalent of a day's supply for its Baltimore plant, indicating that it will not be long in reaching normal production of 6000 transmissions a day. Within a few days all assembly plants are expected to be operating.

Ford

Having caught up on most of its back orders Ford Motor Company's Rouge plants last week dropped back to a five-day basis but assembly operations are understood still to be on a basis of around 150,000 cars and trucks for May. Ford dealers are estimated to have less than 30 days' supply of new cars on hand.

Buick

Buick's April retail sales totaled 6960 units compared with 6534 in March and 6147 in April, 1934. The last 10 days of April accounted for 2732 units which compared with 2552 in the preceding 10 days and 1704 in the last 10 days of April last year. Contrary to the general trend, Buick's unfilled orders have been increasing and at mid-month were the largest since the first of the year despite heavy shipments. During the past three weeks daily receipts of orders have consistently exceeded production and shipment rate with the result that the company entered the second half of May with 5770 unfilled orders on hand against 4000 the first of the month. Production is averaging close to 400 cars a day with the May schedule calling for an output of 8000 cars for domestic and foreign markets. During the first 10 days of May, retail deliveries totaled 2100 cars compared with 1581 in corresponding 1934 period and 1678 in the first 10 days of April.

Hudson-Terraplane

While under the peak figures for the year, Hudson's retail sales during the week ended May 11 ran well over 2000, showing a 25 per cent increase over the preceding week. Production was maintained on a basis of around 10,000 cars for the month. Hudson has signed 798 new dealers since Dec. 1, when the 1935 line was announced.

Pontiac

Pontiac retail deliveries during the first 10 days of May totaled 5062, slightly under the first 10 days of April, but well over the corresponding week of last year. Production continues on a basis of between 18,000 and 19,000 cars for the month, or about the same rate as in April. That Pontiac production did not suffer from the strike is indicated by the fact that on two successive days last week output went over the 1000 mark for a new high this year. Throughout the month Pontiac's daily production did not fall below 836 cars.

On May 14, Pontiac production of 1935 models passed the entire total of 1934 model production. By the close of the day the company had turned out 77,400 of this year's cars as against entire output of 76,553 of 1934 cars.

Plymouth

While Plymouth deliveries eased below the peak figures for the year, deliveries in the week ended May 11, totaling 9435, were well in excess of the 7675 cars delivered in the corresponding week last year. Domestic retail sales for the first 19 weeks this year were 146,350 cars compared with 104,314 units in the like 1934 period.

Chrysler Corp.

Production of the Chrysler Corp. as a whole in April is understood to have reached a new high of over 89,000 units, comparing with 82,000 in April, 1934, and bringing the first four months' total for 1935 to better than 338,000 units, an increase of 35 per cent over the corresponding period of last year. The Plymouth division accounted for nearly 47,000 units in April; DeSoto, a little more than 3000, and Chrysler division about 6300 units.

Chrysler

Up to May 11 this year, Chrysler dealers had delivered 15,529 Chrysler cars and 56,331 Plymouths, a total of 71,860 units, compared with 47,119 units in the corresponding 19 weeks of 1934. Deliveries for the week ended May 11 totaled 3641 Plymouths and 1152 Chryslers, a total of 4793 units comparing with 3913 Plymouths, 1275 Chryslers and combined deliveries of 5188 units in the preceding week. Figures are exclusive of deliveries by Dodge and DeSoto dealers.

Dodge

Dodge dealers during the week ended May 11 delivered 7226 Dodge and Plymouth passenger cars and 1190 trucks, in all 8416 vehicles, compared with 7773 passenger cars and 1303 trucks, or a total of 9076 units, in the preceding week. In the first 19 weeks this year Dodge dealers delivered 112,033 passenger cars and 19,163 trucks, or 131,196 units comparing with 82,178 vehicles in the corresponding period of 1934. This is an increase of 59.6 per cent. Dodge passenger car production continues near the 1000 car level daily, the rate obtaining for several weeks, while truck volume is around 300 a day.

Graham-Paige

Graham-Paige is working on a May schedule of 2600 cars compared with an output of 1882 in April. Dealers have approximately a month's supply of cars on hand and unfilled orders at the factory total 1000. Graham has added 350 new sales outlets since the first of the year, bringing the total to 1285.

Federal

Federal Motor Truck reports that April shipments were the heaviest for any month since March, 1930, and that shipments to date this year show a 25 per cent increase over 1934 figures. The plant is operating at top speed with several departments working two shifts and the working force is the largest since 1929. Federal's export shipments last year were up 125 per cent over 1933.

GM Fleet Sales

April sales of General Motors Fleet Sales Corp. exceeded any month in the history of this division.

Ford Trucks

Ford truck sales in the first four months totaled 42,380 units, as compared with 22,910 units in the same period of 1934, an increase of more than 84 per cent. Commercial car sales in the same period totaled 30,889 as compared with parallel months last year, a gain of 86 per cent. Total sales of both trucks and commercial cars were 73,269 units as against 39,485 in the same period last year. Ford truck and commercial car sales in April were 20,102, the largest month's volume to be recorded in recent years.

Nash

Shipments of cars to dealers by the Nash Motors Company during the first four months of this year have been greater than during any similar period since 1931,

District sales representatives of the Graham-Paige from all parts of the United States and Canada, who attended a sales conference in Detroit to inaugurate the company's "Victory Drive" which has for its objective the doubling of Graham sales during the next three months.

Permissible Compression Stresses of Steels

REFERRING to the compression-stress chart published in *Automotive Industries* of April 20, Thomas H. Wickenden, assistant manager of the Development and Research Department of the International Nickel Company, writes that to be able to use the chart to advantage, one has to know the permissible surface stresses for various materials. From the experience of his company it appears that 200,000 lb. per sq. in. is about right for case-hardened gears of 3.5 per cent nickel steel when used intermittently as in automotive service. For oil-hardened gears of 2350 and 3250 steels in intermittent use, as in automobile transmissions, 160,000 lb. per sq. in. has been found to be about right. For case-hardened gears of 4615 and 2315 steels, also in intermittent use, 200,000 lb. per sq. in. can be used, while case-hardened gears of 2512 and 4815 steels will stand 220,000 lb. per sq. in. Mr. Wickenden says he feels that where the gears are operating under load constantly, the stresses should be about 25 per cent lower than the values given in the foregoing.

If any of our readers have data on the limiting compression stresses in steels of various grades we should like to hear from them.

Colloidal Graphite

According to the Acheson Colloids Corp., electric-furnace graphite, which is extremely inert with respect to the new cadmium-silver and copper-lead bearings is not affected at ordinary temperatures by acids, alkalies, or salts save hot concentrated solutions of compounds of a highly oxidizing nature. Even fuming nitric acid must be repeatedly applied to graphite in the presence of potassium chlorate in order to form graphitic acid. Furthermore, oxygen will not combine with electric-furnace graphite until the latter has been subjected to a temperature of approximately 1200 deg. Fahr., when carbon dioxide results. Even at this extreme temperature the rate of oxidation is relatively slow.

The role of graphite electrodes* in commercial practice substantiates these points.

On this basis it may be assumed, that graphite in the colloidal state or otherwise, is inert chemically with respect to a wide variety of substances. Its inert properties with regard to bearing metals and its resulting ability to retard rather than to promote corrosion is said to be substantiated by a number of pertinent laboratory tests.

Mabery, Falz and others have pointed out that in the formation of graphoid surfaces, colloidal graphite is physically adsorbed—not chemically combined—by the friction parts. Jenkins verified this by taking an "electron picture" of an iron surface which had been treated with colloidal graphite. The resulting "views" definitely revealed the graphite and iron to be associated physically. Had chemical union taken place no such observation could have been made.

Finally, carbon forms a carbide by interaction with only certain metals. Of the common ones used in internal combustion engines, such as lead, zinc, tin, copper and silver no carbides are formed. Aluminum and iron, while reacting with carbon, do not do so under conditions* encountered in internal combustion engines.

* It should be observed that the graphite contained in the colloidal products of the Acheson Colloids Corporation is an extremely pure variety manufactured under conditions parallel to those in which electrodes are produced.

* 2800° F. is the approximate temperature required for the rapid union of aluminum and carbon in vacuo. Iron carbide or cementite, forms during cast iron production at the solidification point of the melted iron of approximately 2300-2500° F. temperature.

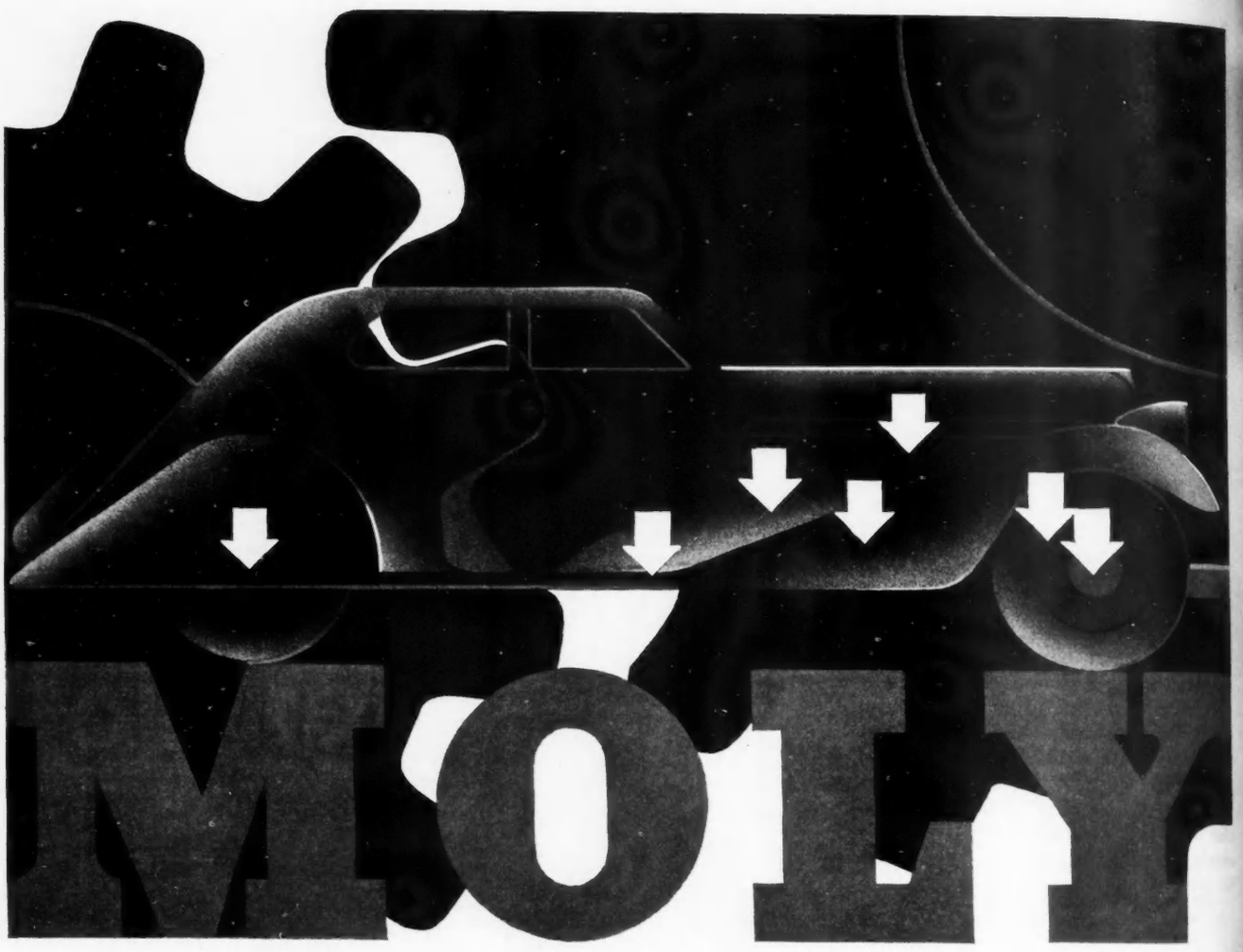
This much Derma-San halts Oil Dermatitis

YOU pour only 1 pint of Derma-San into every 35 gallons of cutting lubricant to keep this serious skin disease out of your shop. For Derma-San is 15 times more powerful than carbolic acid. That is why such a small amount sterilizes cutting oils—kills pus-forming germs before they enter cuts and scratches. When you consider how little is the cost of Derma-San protection, you cannot afford to be without it. Order a drum—today.

The HUNTINGTON LABORATORIES Inc.

DENVER HUNTINGTON, INDIANA TORONTO

DERMA-SAN IS EXCELLENT FOR ALL GENERAL PLANT SANITATION



puts vitality into carburizing steels

REAR-END and transmission gears, pinions, cam and crankshafts, spindles, wrist and steering-knuckle pins . . . more is demanded of them than ever before in the history of the automotive industry. Many of the steels on the market are suitable for the carburizing required for such parts facing the stress of high speed, shocks and the fatigue of long periods of continuous heat and action.

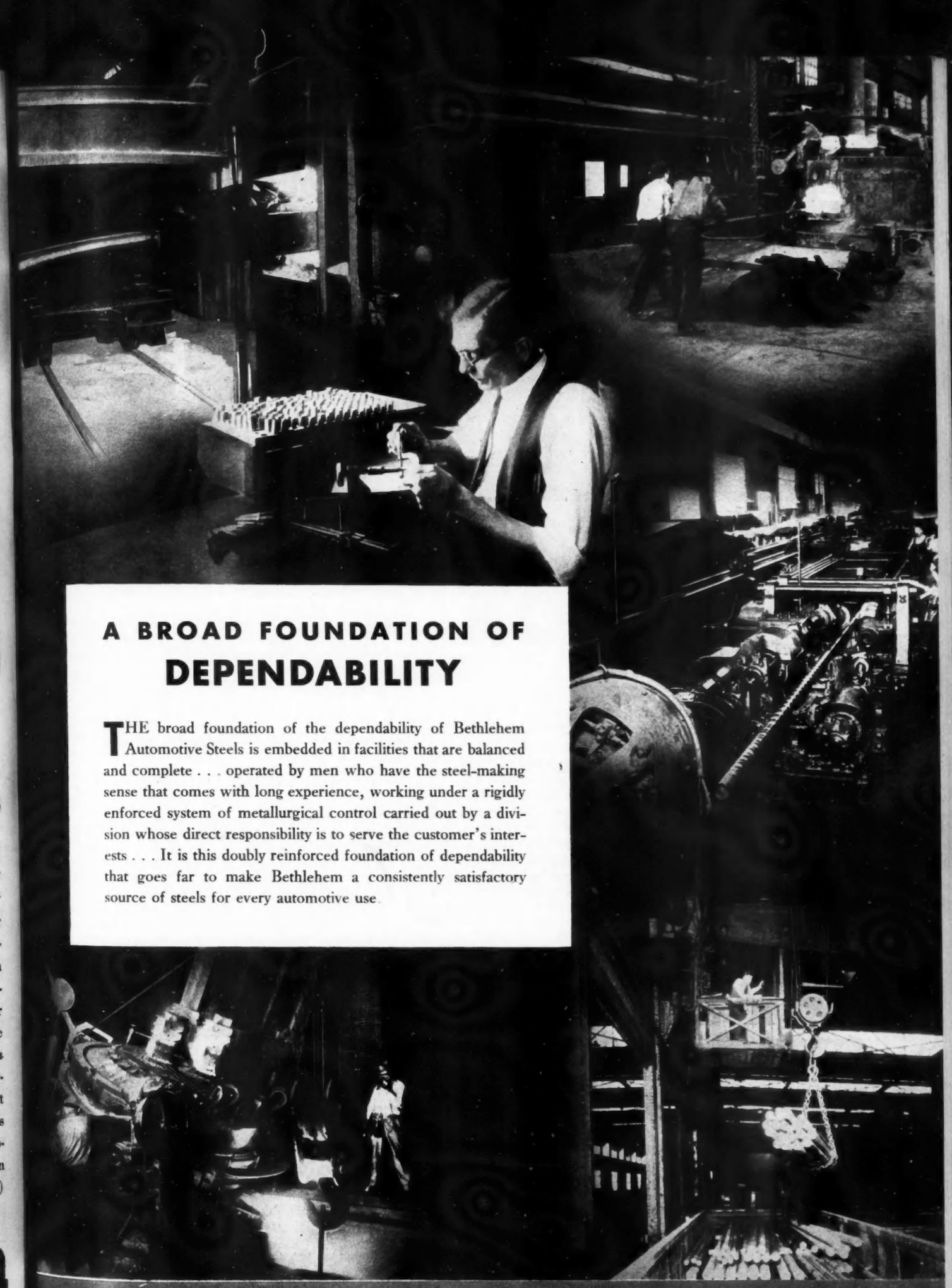
But today there must also be considered the important matter of *facility* in the construction of such parts.

SAE 4615 (Nickel Molybdenum) is widely proving itself the most economical and otherwise most desirable steel for carburized gears of all types and other parts requiring the same properties. Good machinability—tough and refined case and core when quenched from the carburizing pot—and small and measurable distortion during heat treating . . . are some of the properties which have led to almost national standardization on this steel for automotive carburized parts.

There is also, of course, the 3.5% Nickel Molybdenum steel for similar, but heavier-duty applications.

Follow the rapid strides being made by "Moly" in most every diversification of the steel and iron industry — by asking to be put on the mailing list of our periodical house organ, "*The Moly Matrix.*" Write also for these interesting books: "*Molybdenum in* 1934" and "*Molybdenum in Cast Iron* — 1934 *Supplement.*" And, if you've an alloy problem that's difficult to solve, be free to enlist the help of our metallurgists and Detroit experimental laboratory. Climax Molybdenum Company, 500 Fifth Ave., New York City. (In Canada: Railway & Power Engineering Corp., Ltd.)

CLIMAX Mo-lyb-den-um



A BROAD FOUNDATION OF
DEPENDABILITY

THE broad foundation of the dependability of Bethlehem Automotive Steels is embedded in facilities that are balanced and complete . . . operated by men who have the steel-making sense that comes with long experience, working under a rigidly enforced system of metallurgical control carried out by a division whose direct responsibility is to serve the customer's interests . . . It is this doubly reinforced foundation of dependability that goes far to make Bethlehem a consistently satisfactory source of steels for every automotive use.

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